

# ANALYTICAL REPORT

May 24, 2019

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Tr

<sup>6</sup>Gl

<sup>7</sup>Al

<sup>8</sup>Sc

## Cardno - Newark, DE

Sample Delivery Group: L1096387

Samples Received: 05/08/2019

Project Number:

Description:

Report To: Art Saunders  
121 Continental Drive Suite 308  
Newark, DE 19713

Entire Report Reviewed By:



Craig Cothron  
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



90016231

# TABLE OF CONTENTS

ONE LAB. NATIONWIDE.



<b>Cp: Cover Page</b>	<b>1</b>	 <sup>1</sup> <b>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	 <sup>2</sup> <b>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	 <sup>3</sup> <b>Ss</b>
<b>Cn: Case Narrative</b>	<b>4</b>	 <sup>4</sup> <b>Cn</b>
<b>Tr: TRRP Summary</b>	<b>5</b>	 <sup>5</sup> <b>Tr</b>
<b>Gl: Glossary of Terms</b>	<b>6</b>	 <sup>6</sup> <b>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>7</b>	 <sup>7</sup> <b>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>8</b>	 <sup>8</sup> <b>Sc</b>

## SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



WW-20190505-002-DAY 7 L1096387-01 GW

Collected by  
05/05/19 14:00Collected date/time  
Received date/time  
05/08/19 08:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Subcontracted Analyses	WG1278000	1	05/24/19 00:00	05/24/19 00:00	CBM	Minneapolis, MN 55414

<sup>1</sup>Cp<sup>2</sup>Tc<sup>3</sup>Ss<sup>4</sup>Cn<sup>5</sup>Tr<sup>6</sup>Gl<sup>7</sup>Al<sup>8</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Craig Cothron  
Project Manager

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Tr
- <sup>6</sup> Gl
- <sup>7</sup> Al
- <sup>8</sup> Sc

### Project Narrative

L1096387 -01 contains subout data that is included after the chain of custody.



This data package consists of this signature page, the laboratory review checklist, and the following reportable data as applicable:

R1 - Field chain-of-custody documentation;

R2 - Sample identification cross-reference;

R3 - Test reports (analytical data sheets) for each environmental sample that includes:

- a. Items consistent with NELAC Chapter 5,
- b. dilution factors,
- c. preparation methods,
- d. cleanup methods, and
- e. if required for the project, tentatively identified compounds (TICs).

R4 - Surrogate recovery data including:

- a. Calculated recovery (%R), and
- b. The laboratory's surrogate QC limits.

R5 - Test reports/summary forms for blank samples;

R6 - Test reports/summary forms for laboratory control samples (LCSs) including:

- a. LCS spiking amounts,
- b. Calculated %R for each analyte, and
- c. The laboratory's LCS QC limits.

R7 - Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:

- a. Samples associated with the MS/MSD clearly identified,
- b. MS/MSD spiking amounts,
- c. Concentration of each MS/MSD analyte measured in the parent and spiked samples,
- d. Calculated %Rs and relative percent differences (RPDs), and
- e. The laboratory's MS/MSD QC limits

R8 - Laboratory analytical duplicate (if applicable) recovery and precision:

- a. The amount of analyte measured in the duplicate,
- b. The calculated RPD, and
- c. The laboratory's QC limits for analytical duplicates.

R9 - List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.

R10 - Other problems or anomalies.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Craig Cothron  
Project Manager



## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

### Abbreviations and Definitions

SDG	Sample Delivery Group.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
	The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

<sup>1</sup>Cp<sup>2</sup>Tc<sup>3</sup>Ss<sup>4</sup>Cn<sup>5</sup>Tr<sup>6</sup>Gl<sup>7</sup>Al<sup>8</sup>Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

- \* Not all certifications held by the laboratory are applicable to the results reported in the attached report.
- \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

## State Accreditations

Alabama	40660
Alaska	17-026
Arizona	AZ0612
Arkansas	88-0469
California	2932
Colorado	TN00003
Connecticut	PH-0197
Florida	E87487
Georgia	NELAP
Georgia <sup>1</sup>	923
Idaho	TN00003
Illinois	200008
Indiana	C-TN-01
Iowa	364
Kansas	E-10277
Kentucky <sup>1,6</sup>	90010
Kentucky <sup>2</sup>	16
Louisiana	AI30792
Louisiana <sup>1</sup>	LA180010
Maine	TN0002
Maryland	324
Massachusetts	M-TN003
Michigan	9958
Minnesota	047-999-395
Mississippi	TN00003
Missouri	340
Montana	CERT0086

Nebraska	NE-OS-15-05
Nevada	TN-03-2002-34
New Hampshire	2975
New Jersey-NELAP	TN002
New Mexico <sup>1</sup>	n/a
New York	11742
North Carolina	Env375
North Carolina <sup>1</sup>	DW21704
North Carolina <sup>3</sup>	41
North Dakota	R-140
Ohio-VAP	CL0069
Oklahoma	9915
Oregon	TN200002
Pennsylvania	68-02979
Rhode Island	LA000356
South Carolina	84004
South Dakota	n/a
Tennessee <sup>1,4</sup>	2006
Texas	T104704245-18-15
Texas <sup>5</sup>	LAB0152
Utah	TN00003
Vermont	VT2006
Virginia	460132
Washington	C847
West Virginia	233
Wisconsin	9980939910
Wyoming	A2LA

## Third Party Federal Accreditations

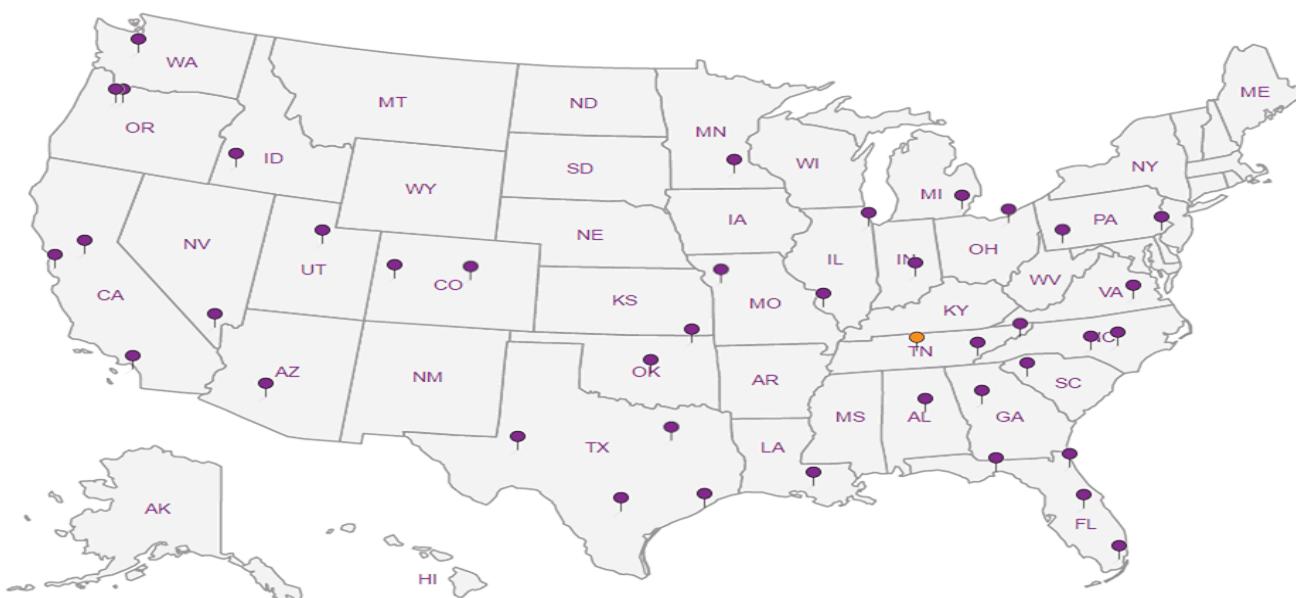
A2LA – ISO 17025	1461.01
A2LA – ISO 17025 <sup>5</sup>	1461.02
Canada	1461.01
EPA-Crypto	TN00003

AIHA-LAP,LLC EMLAP	100789
DOD	1461.01
USDA	P330-15-00234

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.



- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Tr
- <sup>6</sup> Gl
- <sup>7</sup> Al
- <sup>8</sup> Sc



**Report Prepared for:**

Benita Miller  
Pace Analytical National  
12065 Lebanon Road  
Mount Juliet TN 37122

**REPORT OF  
LABORATORY  
ANALYSIS FOR  
PCDD/PCDF**

**Report Prepared Date:**  
May 17, 2019

**Report Information:**

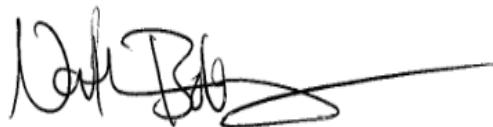
**Pace Project #:** 10474223  
**Sample Receipt Date:** 05/09/2019  
**Client Project #:** L1096387: WG1278000  
**Client Sub PO #:** L1096387  
**State Cert #:** T104704192

**Invoicing & Reporting Options:**

The report provided has been invoiced as a Level 3 PCDD/PCDF Report. If an upgrade of this report package is requested, an additional charge may be applied.

Please review the attached invoice for accuracy and forward any questions to Nathan Boberg, your Pace Project Manager.

**This report has been reviewed by:**



May 23, 2019

Nathan Boberg, Project Manager  
612-360-0728  
(612) 607-6444 (fax)  
nathan.boberg@pacelabs.com



**Report of Laboratory Analysis**

This report should not be reproduced, except in full, without the written consent of Pace Analytical Services, Inc.

The results relate only to the samples included in this report.



Pace Analytical Services, LLC.  
1700 Elm Street  
Minneapolis, MN 55414  
Phone: 612.607.1700  
Fax: 612.607.6444

## **DISCUSSION**

This report presents the results from the analysis performed on one sample submitted by a representative of Pace Analytical National. The sample was analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using USEPA Method 1613B. The reporting limits were based on signal-to-noise measurements. Estimated Maximum Possible Concentration (EMPC) values were treated as positives in the toxic equivalence calculations.

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extract ranged from 62-92%. All of the labeled standard recoveries obtained for this project were within the target ranges specified in Method 1613B. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for recovery and accurate values were obtained.

Values were flagged "I" where incorrect isotope ratios were obtained. Concentrations below the calibration range were flagged "J" and should be regarded as estimates.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show that PCDDs and PCDFs were not detected.

Laboratory spike samples were also prepared with the sample batch using clean reference matrix that had been fortified with native standard materials. The results show that the spiked native compounds were recovered at 100-127% with relative percent differences of 0.9-7.6%. These results were within the target ranges for the method. Matrix spikes were not prepared with the sample batch.

## **REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

## Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE)	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP)	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## Reporting Flags

- A = Reporting Limit based on signal to noise
- B = Less than 10x higher than method blank level
- C = Result obtained from confirmation analysis
- D = Result obtained from analysis of diluted sample
- E = Exceeds calibration range
- I = Interference present
- J = Estimated value
- L = Suppressive interference, analyte may be biased low
- Nn = Value obtained from additional analysis
- P = PCDEInterference
- R = Recovery outside target range
- S = Peak saturated
- U = Analyte not detected
- V = Result verified by confirmation analysis
- X = %D Exceeds limits
- Y = Calculated using average of daily RFs
- \* = See Discussion

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## **Appendix A**

### **Sample Management**



Pace Analytical Services, Inc.  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

## Sample ID Cross Reference

**Client Sample ID**

WW-20190505-002-DAY 7

**Pace Sample ID**

10474223001

**Date Received**

05/09/2019

**Sample Type**

Water

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## **CHAIN-OF-CUSTODY / Analytical Request Document**

**The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.**

Section A		Section B		Section C			
<b>Required Client Information:</b>		<b>Required Project Information:</b>		<b>Invoice Information:</b>			
Company: Pace Analytical National		Report To: Pace Analytical National Subout Team		Attention: Art Saunders			
Address: 12065 Lebanon Road		Copy To:		Company Name:			
Mount Juliet, TN 37122				Address:			
Email: SuboutTeam@pacenational.com		Purchase Order #: L1096387		Pace Quote:			
Phone: (615)773-9756	Fax: (615)758-5859	Project Name: N/A		Pace Project Manager: Nathan Boberg			
Requested Due Date: 22-May		Project #: N/A		Pace Profile #: 38076			
Page : 1 Of 1							
Regulatory Agency:							
State / Location:							
DE							

Page : 1 Of 1

**SAMPLE ID**

**One Character per box.  
(A-Z, 0-9 / . -)**

**Sample Ids must be unique**

MATRIX	CODE
Drinking Water	DW
Water	WT
Waste Water	WW
Product	P
Soil/Solid	SL
Oil	OL
Wipe	WP
Air	AR
Other	OT
Tissue	TS

איסוף קודם קיימת

COLLECTED	
START	END
DATE	TIME

SAMPLE TEMP AT COLLECTION		Preservatives	
#	# OF CONTAINERS		
1	2	Unpreserved	
		H <sub>2</sub> SO <sub>4</sub>	
		HNO <sub>3</sub>	
		HCl	
		NaOH	
		Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	
		Methanol	
		Other	

DIOXINE(BANS) method 1613/PEOS-PFAS method 537

WO# : 10474223



10474223

Bessidium Chorine (2)

601

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
	Benita Miller <i>BM</i>	8-May	15:38	GMAT Pace	5/9/19	8:30 A.M.	Y N Y
Pace Analytical National Batch: WG1278000							
Pace Analytical National SDGs: L1096387							
Location: Minneapolis, MN 55414							
SAMPLER NAME AND SIGNATURE							
PRINT Name of SAMPLER:							
SIGNATURE of SAMPLER:				DATE Signed:			

Pace Analytical National Batch: WG1278000

Pace Analytical National SDGs: L1096387

**Location:** Minneapolis, MN 55414

<i>Pace Analytical</i>	Document Name: <b>Sample Condition Upon Receipt Form</b>	Document Revised: 05Apr2019 Page 1 of 1
	Document No.: <b>F-MN-L-213-rev.27</b>	Issuing Authority: Pace Minnesota Quality Office

<b>Sample Condition Upon Receipt</b>	<b>Client Name:</b> <i>Pace National</i>	<b>Project #:</b> <b>WO# : 10474223</b>
<b>Courier:</b>	<input checked="" type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> USPS <input type="checkbox"/> Client <input type="checkbox"/> Pace <input type="checkbox"/> Speedee <input type="checkbox"/> Commercial See Exception	<b>PM: NB3</b> <b>Due Date: 05/23/19</b>
<b>Tracking Number:</b>	<i>1023 1350 1688</i>	<b>CLIENT: ESC_TN</b>
<b>Custody Seal on Cooler/Box Present?</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<b>Seals Intact?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <b>Biological Tissue Frozen?</b> <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
<b>Packing Material:</b>	<input type="checkbox"/> Bubble Wrap <input checked="" type="checkbox"/> Bubble Bags <input type="checkbox"/> None <input type="checkbox"/> Other: _____	<b>Temp Blank?</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<b>Thermometer:</b>	<input type="checkbox"/> T1(0461) <input type="checkbox"/> T2(1336) <input type="checkbox"/> T3(0459) <input checked="" type="checkbox"/> T4(0254) <input type="checkbox"/> T5(0048)	<b>Type of Ice:</b> <input checked="" type="checkbox"/> Wet <input type="checkbox"/> Blue <input type="checkbox"/> None <input type="checkbox"/> Dry <input type="checkbox"/> Melted
<b>Note:</b> Each West Virginia Sample must have temp taken (no temp blanks)		
Temp should be above freezing to 6°C	<b>Cooler Temp Read w/temp blank:</b> <i>0.5</i> °C	<b>Average Corrected Temp</b> See Exceptions <b>(no temp blank only):</b> <i>0.7</i> °C
<b>Correction Factor:</b> <i>10.2</i>	<b>Cooler Temp Corrected w/temp blank:</b> <i>0.7</i> °C	
<b>USDA Regulated Soil:</b> ( <input checked="" type="checkbox"/> N/A, water sample/Other: _____)	<b>Date/Initials of Person Examining Contents:</b> <i>GINZ 5/9/19</i>	
Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)? <input type="checkbox"/> Yes <input type="checkbox"/> No	Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.		
<b>COMMENTS:</b>		
Chain of Custody Present and Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Relinquished?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Sampler Name and/or Signature on COC?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	3.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	4.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. <input type="checkbox"/> Fecal Coliform <input type="checkbox"/> HPC <input type="checkbox"/> Total Coliform/E coli <input type="checkbox"/> BOD/cBOD <input type="checkbox"/> Hex Chrome <input type="checkbox"/> Turbidity <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> Orthophos <input type="checkbox"/> Other
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Correct Containers Used? -Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8.
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Field Filtered Volume Received for Dissolved Tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10. Is sediment visible in the dissolved container? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is sufficient information available to reconcile the samples to the COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. If no, write ID/ Date/Time on Container Below: See Exception <i>     </i> <input type="checkbox"/>
Matrix: <input checked="" type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Oil <input type="checkbox"/> Other		
All containers needing acid/base preservation have been checked?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12. Sample #  <input type="checkbox"/> NaOH <input type="checkbox"/> HNO <sub>3</sub> <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> Zinc Acetate
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , <2pH, NaOH >9 Sulfide, NaOH>12 Cyanide)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Positive for Res. <input type="checkbox"/> Yes Chlorine? <input type="checkbox"/> No    pH Paper Lot# See Exception <i>     </i> <input type="checkbox"/> Res. Chlorine    0-6 Roll    0-6 Strip    0-14 Strip
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFA		
Headspace in VOA Vials (greater than 6mm)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13. See Exception <i>     </i> <input type="checkbox"/>
Trip Blank Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14. Pace Trip Blank Lot # (if purchased): _____

**CLIENT NOTIFICATION/RESOLUTION**

Person Contacted: \_\_\_\_\_  
Comments/Resolution: \_\_\_\_\_

**Field Data Required?**     Yes     No

Date/Time: \_\_\_\_\_

**Project Manager Review:**
*Nathan Pober*
**Date:** *5/10/19*

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office ( i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: *Clif*

## **Appendix B**

### **Sample Analysis Summary**



## Method 1613B Sample Analysis Results

Client - Pace Analytical National

Client's Sample ID	WW-20190505-002-DAY 7		
Lab Sample ID	10474223001		
Filename	F190516A_18		
Injected By	SMT		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	05/05/2019 14:00
ICAL ID	F190508	Received	05/09/2019 10:22
CCal Filename(s)	F190516A_04	Extracted	05/13/2019 12:30
Method Blank ID	BLANK-70466	Analyzed	05/16/2019 20:31

Native Isomers	Conc pg/L	EMPC pg/L	EDL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	---	1.4	2,3,7,8-TCDF-13C	2.00	86
Total TCDF	ND	---	1.4	2,3,7,8-TCDD-13C	2.00	81
				1,2,3,7,8-PeCDF-13C	2.00	91
2,3,7,8-TCDD	ND	---	1.8	2,3,4,7,8-PeCDF-13C	2.00	90
Total TCDD	ND	---	1.8	1,2,3,7,8-PeCDD-13C	2.00	92
				1,2,3,4,7,8-HxCDF-13C	2.00	81
1,2,3,7,8-PeCDF	ND	---	1.6	1,2,3,6,7,8-HxCDF-13C	2.00	83
2,3,4,7,8-PeCDF	ND	---	1.9	2,3,4,6,7,8-HxCDF-13C	2.00	84
Total PeCDF	ND	---	1.8	1,2,3,7,8,9-HxCDF-13C	2.00	79
				1,2,3,4,7,8-HxCDD-13C	2.00	72
1,2,3,7,8-PeCDD	ND	---	1.8	1,2,3,6,7,8-HxCDD-13C	2.00	68
Total PeCDD	ND	---	1.8	1,2,3,4,6,7,8-HpCDF-13C	2.00	65
				1,2,3,4,7,8,9-HpCDF-13C	2.00	62
1,2,3,4,7,8-HxCDF	ND	---	0.59	1,2,3,4,6,7,8-HpCDD-13C	2.00	66
1,2,3,6,7,8-HxCDF	ND	---	0.55	OCDD-13C	4.00	62
2,3,4,6,7,8-HxCDF	ND	---	0.62			
1,2,3,7,8,9-HxCDF	ND	---	0.82	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	---	0.65	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	---	1.1	2,3,7,8-TCDD-37Cl4	0.20	105
1,2,3,6,7,8-HxCDD	ND	---	1.2			
1,2,3,7,8,9-HxCDD	ND	---	1.4			
Total HxCDD	ND	---	1.2			
1,2,3,4,6,7,8-HpCDF	ND	---	0.89	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	---	0.76	Equivalence: 0.012 pg/L		
Total HpCDF	ND	---	0.82	(Lower-bound - Using 2005 WHO Factors)		
1,2,3,4,6,7,8-HpCDD	---	1.0	0.99	J		
Total HpCDD	ND	---	0.99			
OCDF	ND	---	2.0			
OCDD	---	6.6	1.7	I		

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).

ND = Not Detected

EMPC = Estimated Maximum Possible Concentration

NA = Not Applicable

EDL = Estimated Detection Limit

NC = Not Calculated

J = Estimated value

I = Interference present

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## 2,3,7,8-TCDD Toxic Equivalency (TEQ) Calculations

Pace Analytical National

Client's Sample ID	WW-20190505-002-DAY 7		
Lab Sample ID	10474223001		
Filename	F190516A_18		
Injected By	SMT		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	05/05/2019 14:00
ICAL ID	F190508	Received	05/09/2019 10:22
CCal Filename(s)	F190516A_04	Extracted	05/13/2019 12:30
Method Blank ID	BLANK-70466	Analyzed	05/16/2019 20:31

Parameter	Conc pg/L	RL pg/L	WHO2005	LB	MB	UB
2,3,7,8-TCDF	ND	1.4	0.10000	0.0000	0.0701	0.1403
Total TCDF	ND	1.4	0.00000	0.0000	0.0000	0.0000
2,3,7,8-TCDD	ND	1.8	1.00000	0.0000	0.8986	1.7973
Total TCDD	ND	1.8	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDF	ND	1.6	0.03000	0.0000	0.0238	0.0477
2,3,4,7,8-PeCDF	ND	1.9	0.30000	0.0000	0.2890	0.5779
Total PeCDF	ND	1.8	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDD	ND	1.8	1.00000	0.0000	0.9104	1.8208
Total PeCDD	ND	1.8	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDF	ND	0.59	0.10000	0.0000	0.0297	0.0595
1,2,3,6,7,8-HxCDF	ND	0.55	0.10000	0.0000	0.0275	0.0550
2,3,4,6,7,8-HxCDF	ND	0.62	0.10000	0.0000	0.0308	0.0616
1,2,3,7,8,9-HxCDF	ND	0.82	0.10000	0.0000	0.0412	0.0824
Total HxCDF	ND	0.65	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDD	ND	1.1	0.10000	0.0000	0.0528	0.1055
1,2,3,6,7,8-HxCDD	ND	1.2	0.10000	0.0000	0.0596	0.1192
1,2,3,7,8,9-HxCDD	ND	1.4	0.10000	0.0000	0.0687	0.1375
Total HxCDD	ND	1.2	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDF	ND	0.89	0.01000	0.0000	0.0044	0.0089
1,2,3,4,7,8,9-HpCDF	ND	0.76	0.01000	0.0000	0.0038	0.0076
Total HpCDF	ND	0.82	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDD	ND	0.99	0.01000	0.0103	0.0103	0.0103
Total HpCDD	ND	0.99	0.00000	0.0000	0.0000	0.0000
OCDF	ND	2.0	0.00030	0.0000	0.0003	0.0006
OCDD	ND	1.7	0.00030	0.0020	0.0020	0.0020

0.012 pg/L      2.5 pg/L      5.0 pg/L

Final values are valid to only 2 significant figures

TEQs for Totals classes include contributions from non 2,3,7,8 isomers only

LB = Lower Bound, Where "ND", TEQ Conc = 0

MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) \* (TEF Factor)

UB = Upper Bound, Where "ND", TEQ Conc = LOD \* (TEF Factor)

RL = Reporting Limit

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
 without the written consent of Pace Analytical Services, Inc.

## **Appendix C**

### **QC and Calibration Results Summary**



## Method 1613B Blank Analysis Results

Lab Sample Name	DFBLKUT	Matrix	
Lab Sample ID	BLANK-70466	Dilution	Water
Filename	U190515A_05	Extracted	NA
Total Amount Extracted	955 mL	Analyzed	05/13/2019 12:30
ICAL ID	U190428	Injected By	05/15/2019 18:02
CCal Filename(s)	U190515A_01		SMT

Native Isomers	Conc pg/L	EMPC pg/L	EDL pg/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	---	1.3	2,3,7,8-TCDF-13C	2.00	84
Total TCDF	ND	---	1.3	2,3,7,8-TCDD-13C	2.00	81
				1,2,3,7,8-PeCDF-13C	2.00	82
2,3,7,8-TCDD	ND	---	4.0	2,3,4,7,8-PeCDF-13C	2.00	84
Total TCDD	ND	---	4.0	1,2,3,7,8-PeCDD-13C	2.00	95
				1,2,3,4,7,8-HxCDF-13C	2.00	70
1,2,3,7,8-PeCDF	ND	---	2.3	1,2,3,6,7,8-HxCDF-13C	2.00	74
2,3,4,7,8-PeCDF	ND	---	2.4	2,3,4,6,7,8-HxCDF-13C	2.00	78
Total PeCDF	ND	---	2.3	1,2,3,7,8,9-HxCDF-13C	2.00	78
				1,2,3,4,7,8-HxCDD-13C	2.00	75
1,2,3,7,8-PeCDD	ND	---	3.5	1,2,3,6,7,8-HxCDD-13C	2.00	68
Total PeCDD	ND	---	3.5	1,2,3,4,6,7,8-HpCDF-13C	2.00	70
				1,2,3,4,7,8-HpCDF-13C	2.00	72
1,2,3,4,7,8-HxCDF	ND	---	2.5	1,2,3,4,6,7,8-HpCDD-13C	2.00	75
1,2,3,6,7,8-HxCDF	ND	---	1.9	OCDD-13C	4.00	78
2,3,4,6,7,8-HxCDF	ND	---	1.4			
1,2,3,7,8,9-HxCDF	ND	---	1.2	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	---	1.8	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	---	1.6	2,3,7,8-TCDD-37Cl4	0.20	103
1,2,3,6,7,8-HxCDD	ND	---	1.6			
1,2,3,7,8,9-HxCDD	ND	---	1.6			
Total HxCDD	ND	---	1.6			
1,2,3,4,6,7,8-HpCDF	ND	---	1.3	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	---	1.2	Equivalence: 0.00065 pg/L		
Total HpCDF	ND	---	1.2	(Lower-bound - Using 2005 WHO Factors)		
1,2,3,4,6,7,8-HpCDD	ND	---	1.7			
Total HpCDD	ND	---	1.7			
OCDF	ND	---	2.7			
OCDD	---	2.2	1.7 IJ			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).

EMPC = Estimated Maximum Possible Concentration

EDL = Estimated Detection Limit

J = Estimated value

I = Interference present

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## 2,3,7,8-TCDD Toxic Equivalency (TEQ) Calculations

Pace Analytical National

Client's Sample ID	DFBLKUT				
Lab Sample ID	BLANK-70466				
Filename	U190515A_05				
Injected By	SMT				
Total Amount Extracted	955 mL		Matrix	Water	
% Moisture	NA		Dilution	NA	
Dry Weight Extracted	NA		Collected	05/10/2019 19:51	
ICAL ID	U190428		Received	05/10/2019 19:51	
CCal Filename(s)	U190515A_01		Extracted	05/13/2019 12:30	
Method Blank ID			Analyzed	05/15/2019 18:02	

Parameter	Conc pg/L	RL pg/L	WHO2005	LB	MB	UB
2,3,7,8-TCDF	ND	1.3	0.10000	0.0000	0.0662	0.1323
Total TCDF	ND	1.3	0.00000	0.0000	0.0000	0.0000
2,3,7,8-TCDD	ND	4.0	1.00000	0.0000	2.0217	4.0435
Total TCDD	ND	4.0	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDF	ND	2.3	0.03000	0.0000	0.0339	0.0678
2,3,4,7,8-PeCDF	ND	2.4	0.30000	0.0000	0.3613	0.7227
Total PeCDF	ND	2.3	0.00000	0.0000	0.0000	0.0000
1,2,3,7,8-PeCDD	ND	3.5	1.00000	0.0000	1.7581	3.5162
Total PeCDD	ND	3.5	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDF	ND	2.5	0.10000	0.0000	0.1274	0.2547
1,2,3,6,7,8-HxCDF	ND	1.9	0.10000	0.0000	0.0934	0.1868
2,3,4,6,7,8-HxCDF	ND	1.4	0.10000	0.0000	0.0699	0.1398
1,2,3,7,8,9-HxCDF	ND	1.2	0.10000	0.0000	0.0602	0.1205
Total HxCDF	ND	1.8	0.00000	0.0000	0.0000	0.0000
1,2,3,4,7,8-HxCDD	ND	1.6	0.10000	0.0000	0.0805	0.1610
1,2,3,6,7,8-HxCDD	ND	1.6	0.10000	0.0000	0.0809	0.1618
1,2,3,7,8,9-HxCDD	ND	1.6	0.10000	0.0000	0.0790	0.1581
Total HxCDD	ND	1.6	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDF	ND	1.3	0.01000	0.0000	0.0063	0.0127
1,2,3,4,7,8,9-HpCDF	ND	1.2	0.01000	0.0000	0.0061	0.0121
Total HpCDF	ND	1.2	0.00000	0.0000	0.0000	0.0000
1,2,3,4,6,7,8-HpCDD	ND	1.7	0.01000	0.0000	0.0084	0.0168
Total HpCDD	ND	1.7	0.00000	0.0000	0.0000	0.0000
OCDF	ND	2.7	0.00030	0.0000	0.0004	0.0008
OCDD	ND	1.7	0.00030	0.0007	0.0007	0.0007

0.00065 pg/L      4.9 pg/L      9.7 pg/L

Final values are valid to only 2 significant figures

TEQs for Totals classes include contributions from non 2,3,7,8 isomers only

LB = Lower Bound, Where "ND", TEQ Conc = 0

MB = Medium Bound, Where "ND", TEQ Conc = (LOD/2) \* (TEF Factor)

UB = Upper Bound, Where "ND", TEQ Conc = LOD \* (TEF Factor)

RL = Reporting Limit

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
 without the written consent of Pace Analytical Services, Inc.



## Method 1613B Laboratory Control Spike Results

Lab Sample ID	LCS-70467	Matrix	Water
Filename	U190515A_02	Dilution	NA
Total Amount Extracted	910 mL	Extracted	05/13/2019 12:30
ICAL ID	U190428	Analyzed	05/15/2019 15:51
CCal Filename	U190515A_01	Injected By	SMT
Method Blank ID	BLANK-70466		

Compound	Cs	Cr	Lower Limit	Upper Limit	% Rec.
2,3,7,8-TCDF	10	11	7.5	15.8	114
2,3,7,8-TCDD	10	13	6.7	15.8	127
1,2,3,7,8-PeCDF	50	53	40.0	67.0	106
2,3,4,7,8-PeCDF	50	53	34.0	80.0	106
1,2,3,7,8-PeCDD	50	53	35.0	71.0	106
1,2,3,4,7,8-HxCDF	50	58	36.0	67.0	115
1,2,3,6,7,8-HxCDF	50	55	42.0	65.0	109
2,3,4,6,7,8-HxCDF	50	54	35.0	78.0	108
1,2,3,7,8,9-HxCDF	50	54	39.0	65.0	109
1,2,3,4,7,8-HxCDD	50	58	35.0	82.0	116
1,2,3,6,7,8-HxCDD	50	62	38.0	67.0	124
1,2,3,7,8,9-HxCDD	50	61	32.0	81.0	121
1,2,3,4,6,7,8-HpCDF	50	59	41.0	61.0	118
1,2,3,4,7,8,9-HpCDF	50	55	39.0	69.0	111
1,2,3,4,6,7,8-HpCDD	50	53	35.0	70.0	106
OCDF	100	120	63.0	170.0	121
OCDD	100	110	78.0	144.0	114
2,3,7,8-TCDD-37Cl4	10	8.2	3.1	19.1	82
2,3,7,8-TCDF-13C	100	66	22.0	152.0	66
2,3,7,8-TCDD-13C	100	66	20.0	175.0	66
1,2,3,7,8-PeCDF-13C	100	66	21.0	192.0	66
2,3,4,7,8-PeCDF-13C	100	67	13.0	328.0	67
1,2,3,7,8-PeCDD-13C	100	75	21.0	227.0	75
1,2,3,4,7,8-HxCDF-13C	100	58	19.0	202.0	58
1,2,3,6,7,8-HxCDF-13C	100	60	21.0	159.0	60
2,3,4,6,7,8-HxCDF-13C	100	62	22.0	176.0	62
1,2,3,7,8,9-HxCDF-13C	100	61	17.0	205.0	61
1,2,3,4,7,8-HxCDD-13C	100	60	21.0	193.0	60
1,2,3,6,7,8-HxCDD-13C	100	54	25.0	163.0	54
1,2,3,4,6,7,8-HpCDF-13C	100	58	21.0	158.0	58
1,2,3,4,7,8,9-HpCDF-13C	100	59	20.0	186.0	59
1,2,3,4,6,7,8-HpCDD-13C	100	63	26.0	166.0	63
OCDD-13C	200	130	26.0	397.0	63

Cs = Concentration Spiked (ng/mL)

Cr = Concentration Recovered (ng/mL)

Rec. = Recovery (Expressed as Percent)

Control Limit Reference: Method 1613, Table 6, 10/94 Revision

R = Recovery outside of control limits

Nn = Value obtained from additional analysis

\* = See Discussion

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

## Method 1613B Laboratory Control Spike Results

Lab Sample ID	LCSD-70468	Matrix	Water
Filename	U190515A_03	Dilution	NA
Total Amount Extracted	897 mL	Extracted	05/13/2019 12:30
ICAL ID	U190428	Analyzed	05/15/2019 16:33
CCal Filename	U190515A_01	Injected By	SMT
Method Blank ID	BLANK-70466		

Compound	Cs	Cr	Lower Limit	Upper Limit	% Rec.
2,3,7,8-TCDF	10	11	7.5	15.8	112
2,3,7,8-TCDD	10	12	6.7	15.8	122
1,2,3,7,8-PeCDF	50	50	40.0	67.0	100
2,3,4,7,8-PeCDF	50	51	34.0	80.0	102
1,2,3,7,8-PeCDD	50	51	35.0	71.0	102
1,2,3,4,7,8-HxCDF	50	57	36.0	67.0	114
1,2,3,6,7,8-HxCDF	50	52	42.0	65.0	105
2,3,4,6,7,8-HxCDF	50	51	35.0	78.0	102
1,2,3,7,8,9-HxCDF	50	51	39.0	65.0	101
1,2,3,4,7,8-HxCDD	50	56	35.0	82.0	113
1,2,3,6,7,8-HxCDD	50	59	38.0	67.0	117
1,2,3,7,8,9-HxCDD	50	58	32.0	81.0	115
1,2,3,4,6,7,8-HpCDF	50	58	41.0	61.0	116
1,2,3,4,7,8,9-HpCDF	50	55	39.0	69.0	109
1,2,3,4,6,7,8-HpCDD	50	51	35.0	70.0	103
OCDF	100	110	63.0	170.0	115
OCDD	100	110	78.0	144.0	112
2,3,7,8-TCDD-37Cl4	10	8.7	3.1	19.1	87
2,3,7,8-TCDF-13C	100	74	22.0	152.0	74
2,3,7,8-TCDD-13C	100	72	20.0	175.0	72
1,2,3,7,8-PeCDF-13C	100	73	21.0	192.0	73
2,3,4,7,8-PeCDF-13C	100	74	13.0	328.0	74
1,2,3,7,8-PeCDD-13C	100	85	21.0	227.0	85
1,2,3,4,7,8-HxCDF-13C	100	62	19.0	202.0	62
1,2,3,6,7,8-HxCDF-13C	100	66	21.0	159.0	66
2,3,4,6,7,8-HxCDF-13C	100	68	22.0	176.0	68
1,2,3,7,8,9-HxCDF-13C	100	68	17.0	205.0	68
1,2,3,4,7,8-HxCDD-13C	100	66	21.0	193.0	66
1,2,3,6,7,8-HxCDD-13C	100	60	25.0	163.0	60
1,2,3,4,6,7,8-HpCDF-13C	100	61	21.0	158.0	61
1,2,3,4,7,8,9-HpCDF-13C	100	65	20.0	186.0	65
1,2,3,4,6,7,8-HpCDD-13C	100	67	26.0	166.0	67
OCDD-13C	200	130	26.0	397.0	65

Cs = Concentration Spiked (ng/mL)

Cr = Concentration Recovered (ng/mL)

Rec. = Recovery (Expressed as Percent)

Control Limit Reference: Method 1613, Table 6, 10/94 Revision

R = Recovery outside of control limits

Nn = Value obtained from additional analysis

\* = See Discussion

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

Method 1613B

## Spike Recovery Relative Percent Difference (RPD) Results

Client Pace Analytical National

Spike 1 ID LCS-70467 Spike 2 ID LCSD-70468  
Spike 1 Filename U190515A\_02 Spike 2 Filename U190515A\_03

Compound	Spike 1 %REC	Spike 2 %REC	%RPD
2,3,7,8-TCDF	114	112	1.8
2,3,7,8-TCDD	127	122	4.0
1,2,3,7,8-PeCDF	106	100	5.8
2,3,4,7,8-PeCDF	106	102	3.8
1,2,3,7,8-PeCDD	106	102	3.8
1,2,3,4,7,8-HxCDF	115	114	0.9
1,2,3,6,7,8-HxCDF	109	105	3.7
2,3,4,6,7,8-HxCDF	108	102	5.7
1,2,3,7,8,9-HxCDF	109	101	7.6
1,2,3,4,7,8-HxCDD	116	113	2.6
1,2,3,6,7,8-HxCDD	124	117	5.8
1,2,3,7,8,9-HxCDD	121	115	5.1
1,2,3,4,6,7,8-HpCDF	118	116	1.7
1,2,3,4,7,8,9-HpCDF	111	109	1.8
1,2,3,4,6,7,8-HpCDD	106	103	2.9
OCDF	121	115	5.1
OCDD	114	112	1.8

%REC = Percent Recovered

RPD = The difference between the two values divided by the mean value

## **REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

**Method 1613B**  
**Initial Calibration (ICAL) - Response Factor Summary**

ICAL ID	F190508	Data Files:			Time	Injected
Calibration Date	05/08/2019	CS-1	F190508A_04	11:43	SMT	
Instrument	10MSHR05 (F)	CS-2	F190508A_03	11:02	SMT	
Column Phase	ZB5-MS 0.25mm	CS-3	F190508A_02	10:00	SMT	
Column ID No.	ZB5-MS-629919	CS-4	F190508A_06	13:46	SMT	
		CS-5	F190508A_05	13:05	SMT	
Isomer		CS-1	CS-2	CS-3	CS-4	CS-5
					Ave RF	%RSD
2,3,7,8-TCDF		0.8288	0.8067	0.8548	0.9247	0.8692
2,3,7,8-TCDD		0.7258	0.7466	0.9053	0.8472	0.8226
1,2,3,7,8-PeCDF		0.7848	0.8155	0.9265	0.9294	0.9605
2,3,4,7,8-PeCDF		0.9141	0.9583	1.0049	1.0616	1.0418
1,2,3,7,8-PeCDD		0.7512	0.7742	0.8516	0.8895	0.8836
1,2,3,4,7,8-HxCDF		1.0236	1.1127	1.1608	1.1726	1.2089
1,2,3,6,7,8-HxCDF		1.0014	1.0246	1.1187	1.1501	1.1270
2,3,4,6,7,8-HxCDF		1.0507	1.1409	1.1858	1.2495	1.2346
1,2,3,7,8,9-HxCDF		0.9781	1.0316	1.0873	1.1379	1.1166
1,2,3,4,7,8-HxCDD		0.8555	0.8687	0.9233	0.9402	0.9573
1,2,3,6,7,8-HxCDD		0.8314	0.9043	0.9052	0.9359	0.9026
1,2,3,7,8,9-HxCDD		0.8565	0.8763	0.9003	0.9266	0.9153
1,2,3,4,6,7,8-HpCDF		1.1049	1.1654	1.1997	1.2823	1.2449
1,2,3,4,7,8,9-HpCDF		1.1387	1.1656	1.2257	1.2892	1.2353
1,2,3,4,6,7,8-HpCDD		0.8917	0.9372	0.9719	1.0276	1.0178
OCDF		0.9256	0.9767	0.9981	1.0986	1.0703
OCDD		0.8835	0.9641	0.9292	0.9824	0.9725
Total PeCDF		0.8494	0.8869	0.9657	0.9955	1.0012
Total HxCDF		1.0134	1.0775	1.1381	1.1775	1.1718
Total HxCDD		0.8478	0.8831	0.9096	0.9343	0.9362
Total HpCDF		1.1218	1.1655	1.2127	1.2857	1.2401
2,3,7,8-TCDF-13C		1.2774	1.2742	1.2612	1.2461	1.2611
2,3,7,8-TCDD-13C		1.0321	1.0459	1.0771	1.0111	1.0470
2,3,7,8-TCDD-37Cl4		0.8169	0.9323	0.9533	0.9783	1.0309
1,2,3,7,8-PeCDF-13C		1.0537	1.0775	1.0227	1.0200	1.0592
2,3,4,7,8-PeCDF-13C		1.0512	1.0726	1.0678	1.0115	1.0827
1,2,3,7,8-PeCDD-13C		0.7608	0.7921	0.7924	0.7409	0.7983
1,2,3,4,7,8-HxCDF-13C		1.1556	1.0886	0.9809	1.1450	1.1002
1,2,3,6,7,8-HxCDF-13C		1.2681	1.2256	1.0928	1.2756	1.2214
2,3,4,6,7,8-HxCDF-13C		1.1349	1.0734	0.9911	1.1211	1.0874
1,2,3,7,8,9-HxCDF-13C		1.0058	0.9854	0.8807	0.9933	0.9866
1,2,3,4,7,8-HxCDD-13C		1.0164	0.9810	0.8696	1.0258	1.0080
1,2,3,6,7,8-HxCDD-13C		1.1202	1.1043	1.0208	1.1355	1.1310
1,2,3,4,6,7,8-HpCDF-13C		1.2491	1.2217	1.0875	1.2280	1.2341
1,2,3,4,7,8,9-HpCDF-13C		0.9880	1.0006	0.8771	0.9634	1.0185
1,2,3,4,6,7,8-HpCDD-13C		1.0980	1.0766	0.9822	1.0556	1.0983
OCDD-13C		0.9188	0.9233	0.8338	0.9071	0.9535

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

**Method 1613B**  
**Initial Calibration (ICAL) - Isotope Ratio Summary**

ICAL ID	<b>F190508</b>	Data Files:	Time	Injected
Calibration Date	05/08/2019	CS-1	F190508A_04	11:43
Instrument	10MSHR05 (F)	CS-2	F190508A_03	11:02
Column Phase	ZB5-MS 0.25mm	CS-3	F190508A_02	10:00
Column ID No.	ZB5-MS-629919	CS-4	F190508A_06	13:46
		CS-5	F190508A_05	13:05

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Limits
2,3,7,8-TCDF	0.76	0.79	0.75	0.76	0.78	0.65 - 0.89
2,3,7,8-TCDD	0.79	0.75	0.82	0.76	0.78	0.65 - 0.89
1,2,3,7,8-PeCDF	1.54	1.53	1.61	1.54	1.58	1.32 - 1.78
2,3,4,7,8-PeCDF	1.53	1.60	1.54	1.55	1.54	1.32 - 1.78
1,2,3,7,8-PeCDD	0.55	0.62	0.61	0.61	0.62	0.52 - 0.70
1,2,3,4,7,8-HxCDF	1.30	1.29	1.28	1.26	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDF	1.22	1.30	1.21	1.26	1.24	1.05 - 1.43
2,3,4,6,7,8-HxCDF	1.27	1.19	1.22	1.24	1.23	1.05 - 1.43
1,2,3,7,8,9-HxCDF	1.43	1.23	1.26	1.21	1.23	1.05 - 1.43
1,2,3,4,7,8-HxCDD	1.26	1.33	1.23	1.24	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD	1.23	1.25	1.21	1.22	1.22	1.05 - 1.43
1,2,3,7,8,9-HxCDD	1.25	1.26	1.21	1.22	1.19	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF	1.05	1.00	1.01	1.02	1.03	0.88 - 1.20
1,2,3,4,7,8,9-HpCDF	0.94	1.06	1.03	1.03	1.03	0.88 - 1.20
1,2,3,4,6,7,8-HpCDD	0.95	1.04	1.00	1.00	1.04	0.88 - 1.20
OCDF	0.94	0.93	0.91	0.90	0.92	0.76 - 1.02
OCDD	0.86	0.86	0.88	0.89	0.88	0.76 - 1.02
1,2,3,4-TCDD-13C	0.79	0.79	0.79	0.78	0.78	0.65 - 0.89
1,2,3,7,8,9-HxCDD-13C	1.25	1.24	1.25	1.24	1.21	1.05 - 1.43
2,3,7,8-TCDF-13C	0.76	0.77	0.78	0.75	0.77	0.65 - 0.89
2,3,7,8-TCDD-13C	0.77	0.78	0.78	0.77	0.77	0.65 - 0.89
1,2,3,7,8-PeCDF-13C	1.61	1.56	1.57	1.56	1.57	1.32 - 1.78
2,3,4,7,8-PeCDF-13C	1.54	1.57	1.58	1.56	1.57	1.32 - 1.78
1,2,3,7,8-PeCDD-13C	1.56	1.58	1.56	1.58	1.54	1.32 - 1.78
1,2,3,4,7,8-HxCDF-13C	0.52	0.51	0.51	0.52	0.52	0.43 - 0.59
1,2,3,6,7,8-HxCDF-13C	0.54	0.51	0.50	0.53	0.52	0.43 - 0.59
2,3,4,6,7,8-HxCDF-13C	0.52	0.51	0.53	0.53	0.53	0.43 - 0.59
1,2,3,7,8,9-HxCDF-13C	0.51	0.53	0.53	0.54	0.52	0.43 - 0.59
1,2,3,4,7,8-HxCDD-13C	1.24	1.26	1.25	1.26	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD-13C	1.26	1.25	1.25	1.26	1.23	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF-13C	0.45	0.43	0.44	0.45	0.44	0.37 - 0.51
1,2,3,4,7,8-HpCDF-13C	0.45	0.44	0.45	0.45	0.44	0.37 - 0.51
1,2,3,4,6,7,8-HpCDD-13C	1.01	1.03	1.03	1.03	1.06	0.88 - 1.20
OCDD-13C	0.89	0.91	0.88	0.91	0.90	0.76 - 1.02

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

**Method 1613B**  
**Initial Calibration (ICAL) - Response Factor Summary**

ICAL ID	<b>U190428</b>	Data Files:			Time	Injected		
Calibration Date	04/28/2019	CS-1	U190428B_03	12:37	BAL			
Instrument	10MSHR06 (U)	CS-2	U190428B_02	11:54	BAL			
Column Phase	ZB5-MS 0.25mm	CS-3	U190428B_01	11:03	JRH			
Column ID No.	1010639	CS-4	U190428B_05	14:14	BAL			
		CS-5	U190428B_04	13:31	BAL			
Isomer		CS-1	CS-2	CS-3	CS-4	CS-5	Ave RF	%RSD
2,3,7,8-TCDF		0.8608	0.9374	0.9177	0.9208	0.8941	0.9061	3.28
2,3,7,8-TCDD		0.9106	0.8828	1.0674	0.8682	0.8636	0.9185	9.28
1,2,3,7,8-PeCDF		0.9027	0.8757	0.8848	0.8508	0.8569	0.8742	2.41
2,3,4,7,8-PeCDF		1.0083	0.9750	0.9731	0.9566	0.9502	0.9726	2.32
1,2,3,7,8-PeCDD		0.8918	0.8840	0.8706	0.8592	0.8754	0.8762	1.42
1,2,3,4,7,8-HxCDF		1.1558	1.0950	1.0622	1.0910	1.0620	1.0932	3.50
1,2,3,6,7,8-HxCDF		1.0114	1.0332	1.0393	1.0502	1.0295	1.0327	1.38
2,3,4,6,7,8-HxCDF		1.1451	1.1029	1.0644	1.1022	1.1190	1.1067	2.65
1,2,3,7,8,9-HxCDF		1.0072	1.0605	1.0470	1.0296	1.0406	1.0370	1.94
1,2,3,4,7,8-HxCDD		0.9480	0.9263	0.9574	0.9225	0.9120	0.9332	2.01
1,2,3,6,7,8-HxCDD		0.8955	0.9661	0.9249	0.9267	0.8912	0.9209	3.27
1,2,3,7,8,9-HxCDD		0.9569	0.9184	0.9608	0.9338	0.8779	0.9296	3.63
1,2,3,4,6,7,8-HpCDF		1.2567	1.2668	1.2118	1.2145	1.2117	1.2323	2.20
1,2,3,4,7,8,9-HpCDF		1.1842	1.2216	1.2557	1.2539	1.2515	1.2334	2.50
1,2,3,4,6,7,8-HpCDD		0.9691	1.0176	1.0217	0.9847	0.9957	0.9978	2.22
OCDF		1.0808	1.0709	1.0771	1.0924	1.0882	1.0819	0.79
OCDD		1.0229	0.9562	0.9717	0.9623	0.9554	0.9737	2.91
Total PeCDF		0.9555	0.9253	0.9289	0.9037	0.9036	0.9234	2.33
Total HxCDF		1.0799	1.0729	1.0532	1.0683	1.0628	1.0674	0.95
Total HxCDD		0.9335	0.9369	0.9477	0.9277	0.8937	0.9279	2.20
Total HpCDF		1.2204	1.2442	1.2337	1.2342	1.2316	1.2328	0.69
2,3,7,8-TCDF-13C		1.3183	1.3399	1.3364	1.2931	1.3277	1.3231	1.41
2,3,7,8-TCDD-13C		1.0291	1.0815	1.0864	1.0354	1.0665	1.0598	2.48
2,3,7,8-TCDD-37Cl4		1.0500	1.1478	1.0495	0.9880	1.0465	1.0564	5.44
1,2,3,7,8-PeCDF-13C		1.0334	1.0485	0.9775	0.9997	1.0519	1.0222	3.17
2,3,4,7,8-PeCDF-13C		0.9606	1.0117	0.9842	0.9642	1.0154	0.9872	2.60
1,2,3,7,8-PeCDD-13C		0.6762	0.7038	0.7149	0.6590	0.7012	0.6910	3.30
1,2,3,4,7,8-HxCDF-13C		1.1302	1.1201	1.0118	1.1747	1.1784	1.1230	6.00
1,2,3,6,7,8-HxCDF-13C		1.2511	1.2789	1.1273	1.3123	1.3117	1.2563	6.09
2,3,4,6,7,8-HxCDF-13C		1.1709	1.1766	1.0641	1.1717	1.1342	1.1435	4.16
1,2,3,7,8,9-HxCDF-13C		0.9686	0.9932	0.9144	1.0040	0.9767	0.9714	3.58
1,2,3,4,7,8-HxCDD-13C		0.9676	0.9636	0.8696	0.9923	0.9900	0.9566	5.26
1,2,3,6,7,8-HxCDD-13C		1.0810	1.0887	1.0081	1.1018	1.1496	1.0858	4.69
1,2,3,4,6,7,8-HpCDF-13C		1.1581	1.2097	1.0823	1.1301	1.1409	1.1442	4.03
1,2,3,4,7,8,9-HpCDF-13C		0.9445	0.9756	0.8253	0.8533	0.8409	0.8879	7.60
1,2,3,4,6,7,8-HpCDD-13C		0.9715	0.9940	0.8798	0.9083	0.9127	0.9333	5.10
OCDD-13C		0.8017	0.7905	0.6650	0.7100	0.6903	0.7315	8.37

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

**Method 1613B**  
**Initial Calibration (ICAL) - Isotope Ratio Summary**

ICAL ID	<b>U190428</b>	Data Files:	Time	Injected
Calibration Date	04/28/2019	CS-1	U190428B_03	12:37
Instrument	10MSHR06 (U)	CS-2	U190428B_02	11:54
Column Phase	ZB5-MS 0.25mm	CS-3	U190428B_01	11:03
Column ID No.	1010639	CS-4	U190428B_05	14:14
		CS-5	U190428B_04	13:31

Isomer	CS-1	CS-2	CS-3	CS-4	CS-5	Limits
2,3,7,8-TCDF	0.74	0.84	0.77	0.76	0.77	0.65 - 0.89
2,3,7,8-TCDD	0.77	0.86	0.75	0.77	0.74	0.65 - 0.89
1,2,3,7,8-PeCDF	1.60	1.48	1.52	1.51	1.49	1.32 - 1.78
2,3,4,7,8-PeCDF	1.47	1.47	1.54	1.55	1.53	1.32 - 1.78
1,2,3,7,8-PeCDD	0.62	0.60	0.62	0.61	0.61	0.52 - 0.70
1,2,3,4,7,8-HxCDF	1.24	1.24	1.22	1.22	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDF	1.24	1.23	1.19	1.22	1.22	1.05 - 1.43
2,3,4,6,7,8-HxCDF	1.32	1.22	1.22	1.19	1.25	1.05 - 1.43
1,2,3,7,8,9-HxCDF	1.31	1.18	1.23	1.26	1.25	1.05 - 1.43
1,2,3,4,7,8-HxCDD	1.34	1.19	1.25	1.23	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD	1.36	1.21	1.25	1.23	1.24	1.05 - 1.43
1,2,3,7,8,9-HxCDD	1.35	1.17	1.29	1.20	1.28	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF	0.97	1.08	1.04	1.03	1.04	0.88 - 1.20
1,2,3,4,7,8,9-HpCDF	0.90	1.02	1.06	1.04	1.05	0.88 - 1.20
1,2,3,4,6,7,8-HpCDD	0.99	0.99	1.02	1.04	1.07	0.88 - 1.20
OCDF	0.85	1.00	0.90	0.89	0.88	0.76 - 1.02
OCDD	0.85	0.85	0.90	0.90	0.88	0.76 - 1.02
1,2,3,4-TCDD-13C	0.78	0.80	0.80	0.79	0.78	0.65 - 0.89
1,2,3,7,8,9-HxCDD-13C	1.25	1.23	1.18	1.20	1.19	1.05 - 1.43
2,3,7,8-TCDF-13C	0.77	0.77	0.79	0.79	0.78	0.65 - 0.89
2,3,7,8-TCDD-13C	0.78	0.78	0.78	0.80	0.78	0.65 - 0.89
1,2,3,7,8-PeCDF-13C	1.53	1.54	1.60	1.57	1.52	1.32 - 1.78
2,3,4,7,8-PeCDF-13C	1.55	1.54	1.56	1.55	1.55	1.32 - 1.78
1,2,3,7,8-PeCDD-13C	1.52	1.55	1.52	1.55	1.58	1.32 - 1.78
1,2,3,4,7,8-HxCDF-13C	0.52	0.53	0.52	0.52	0.53	0.43 - 0.59
1,2,3,6,7,8-HxCDF-13C	0.54	0.54	0.52	0.53	0.53	0.43 - 0.59
2,3,4,6,7,8-HxCDF-13C	0.52	0.52	0.54	0.53	0.53	0.43 - 0.59
1,2,3,7,8,9-HxCDF-13C	0.54	0.53	0.54	0.53	0.54	0.43 - 0.59
1,2,3,4,7,8-HxCDD-13C	1.27	1.22	1.23	1.23	1.24	1.05 - 1.43
1,2,3,6,7,8-HxCDD-13C	1.24	1.22	1.21	1.21	1.21	1.05 - 1.43
1,2,3,4,6,7,8-HpCDF-13C	0.45	0.45	0.44	0.47	0.45	0.37 - 0.51
1,2,3,4,7,8-HpCDF-13C	0.46	0.46	0.46	0.46	0.44	0.37 - 0.51
1,2,3,4,6,7,8-HpCDD-13C	1.06	1.08	1.03	1.03	1.06	0.88 - 1.20
OCDD-13C	0.88	0.92	0.92	0.89	0.89	0.76 - 1.02

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

**Method 1613B Analysis Results  
PCDD/PCDF Calibration Verification  
Labeled Analytes**

Lab Name CS3/CPM-11321-150  
Filename U190515A\_01  
Injected By SMT  
Analyzed 05/15/2019 14:54

Instrument ID 10MSHR06 (U)  
GC Column ID 1010639  
ICAL ID U190428

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
Labeled Compounds					
1,2,3,4-TCDD-13C	M/M+2	0.78	0.65 - 0.89	----	----
2,3,7,8-TCDD-13C	M/M+2	0.77	0.65 - 0.89	97.8	82 - 121
1,2,3,7,8-PeCDD-13C	M+2/M+4	1.57	1.32 - 1.78	107.0	62 - 160
1,2,3,4,7,8-HxCDD-13C	M+2/M+4	1.27	1.05 - 1.43	95.2	85 - 117
1,2,3,6,7,8-HxCDD-13C	M+2/M+4	1.22	1.05 - 1.43	96.1	85 - 118
1,2,3,7,8,9-HxCDD-13C	M+2/M+4	1.21	1.05 - 1.43	----	----
1,2,3,4,6,7,8-HpCDD-13C	M+2/M+4	1.04	0.88 - 1.20	93.8	72 - 138
OCDD-13C	M+2/M+4	0.91	0.76 - 1.02	203.6	96 - 415
2,3,7,8-TCDF-13C	M/M+2	0.76	0.65 - 0.89	99.0	71 - 140
1,2,3,7,8-PeCDF-13C	M+2/M+4	1.55	1.32 - 1.78	95.6	76 - 130
2,3,4,7,8-PeCDF-13C	M+2/M+4	1.57	1.32 - 1.78	102.8	77 - 130
1,2,3,4,7,8-HxCDF-13C	M/M+2	0.53	0.43 - 0.59	94.9	76 - 131
1,2,3,6,7,8-HxCDF-13C	M/M+2	0.53	0.43 - 0.59	93.5	70 - 143
2,3,4,6,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	93.9	73 - 137
1,2,3,7,8,9-HxCDF-13C	M/M+2	0.53	0.43 - 0.59	89.2	74 - 135
1,2,3,4,6,7,8-HpCDF-13C	M/M+2	0.47	0.37 - 0.51	93.8	78 - 129
1,2,3,4,7,8,9-HpCDF-13C	M/M+2	0.44	0.37 - 0.51	91.0	77 - 129
Cleanup Standard					
2,3,7,8-TCDD-37Cl4	M+2/M+4	(4)		9.1	7.9 - 12.7

1. See Table 8, Method 1613, for m/z specifications.
2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.
3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).
4. No ion abundance ratio; report concentration found.

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

**Method 1613B Analysis Results  
PCDD/PCDF Calibration Verification  
Native Analytes**

Lab Name CS3/CPM-11321-150  
Filename U190515A\_01  
Injected By SMT  
Analyzed 05/15/2019 14:54

Instrument ID 10MSHR06 (U)  
GC Column ID 1010639  
ICAL ID U190428

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
2,3,7,8-TCDD	M/M+2	0.71	0.65 - 0.89	12.0	7.8 - 12.9
1,2,3,7,8-PeCDD	M+2/M+4	0.59	0.52 - 0.70	49.9	39 - 65
1,2,3,4,7,8-HxCDD	M+2/M+4	1.19	1.05 - 1.43	50.7	39 - 64
1,2,3,6,7,8-HxCDD	M+2/M+4	1.19	1.05 - 1.43	50.0	39 - 64
1,2,3,7,8,9-HxCDD	M+2/M+4	1.16	1.05 - 1.43	48.6	41 - 61
1,2,3,4,6,7,8-HpCDD	M+2/M+4	1.01	0.88 - 1.20	52.9	43 - 58
OCDD	M+2/M+4	0.87	0.76 - 1.02	107.3	79 - 126
2,3,7,8-TCDF	M/M+2	0.78	0.65 - 0.89	9.5	8.4 - 12.0
1,2,3,7,8-PeCDF	M+2/M+4	1.55	1.32 - 1.78	48.8	41 - 60
2,3,4,7,8-PeCDF	M+2/M+4	1.53	1.32 - 1.78	46.4	41 - 61
1,2,3,4,7,8-HxCDF	M+2/M+4	1.21	1.05 - 1.43	48.5	45 - 56
1,2,3,6,7,8-HxCDF	M+2/M+4	1.23	1.05 - 1.43	50.4	44 - 57
2,3,4,6,7,8-HxCDF	M+2/M+4	1.19	1.05 - 1.43	47.6	44 - 57
1,2,3,7,8,9-HxCDF	M+2/M+4	1.31	1.05 - 1.43	47.5	45 - 56
1,2,3,4,6,7,8-HpCDF	M+2/M+4	1.04	0.88 - 1.20	51.8	45 - 55
1,2,3,4,7,8,9-HpCDF	M+2/M+4	1.02	0.88 - 1.20	51.1	43 - 58
OCDF	M+2/M+4	0.90	0.76 - 1.02	100.9	63 - 159

1. See Table 8, Method 1613, for m/z specifications.
2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.
3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

**Method 1613B Analysis Results  
PCDD/PCDF Calibration Verification  
Labeled Analytes**

Lab Name CS3/CPM-11321-150  
Filename F190516A\_04  
Injected By ZMS  
Analyzed 05/16/2019 10:09

Instrument ID 10MSHR05 (F)  
GC Column ID ZB5-MS-629919  
ICAL ID F190508

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
Labeled Compounds					
1,2,3,4-TCDD-13C	M/M+2	0.78	0.65 - 0.89	----	----
2,3,7,8-TCDD-13C	M/M+2	0.78	0.65 - 0.89	97.0	82 - 121
1,2,3,7,8-PeCDD-13C	M+2/M+4	1.54	1.32 - 1.78	84.2	62 - 160
1,2,3,4,7,8-HxCDD-13C	M+2/M+4	1.26	1.05 - 1.43	88.7	85 - 117
1,2,3,6,7,8-HxCDD-13C	M+2/M+4	1.26	1.05 - 1.43	94.8	85 - 118
1,2,3,7,8,9-HxCDD-13C	M+2/M+4	1.28	1.05 - 1.43	----	----
1,2,3,4,6,7,8-HpCDD-13C	M+2/M+4	1.11	0.88 - 1.20	78.2	72 - 138
OCDD-13C	M+2/M+4	0.88	0.76 - 1.02	161.4	96 - 415
2,3,7,8-TCDF-13C	M/M+2	0.76	0.65 - 0.89	100.6	71 - 140
1,2,3,7,8-PeCDF-13C	M+2/M+4	1.55	1.32 - 1.78	91.0	76 - 130
2,3,4,7,8-PeCDF-13C	M+2/M+4	1.66	1.32 - 1.78	94.0	77 - 130
1,2,3,4,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	99.2	76 - 131
1,2,3,6,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	106.1	70 - 143
2,3,4,6,7,8-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	103.0	73 - 137
1,2,3,7,8,9-HxCDF-13C	M/M+2	0.52	0.43 - 0.59	97.3	74 - 135
1,2,3,4,6,7,8-HpCDF-13C	M/M+2	0.45	0.37 - 0.51	84.3	78 - 129
1,2,3,4,7,8,9-HpCDF-13C	M/M+2	0.48	0.37 - 0.51	79.9	77 - 129
Cleanup Standard					
2,3,7,8-TCDD-37Cl4	M+2/M+4	(4)		9.7	7.9 - 12.7

1. See Table 8, Method 1613, for m/z specifications.
2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.
3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).
4. No ion abundance ratio; report concentration found.

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

**Method 1613B Analysis Results  
PCDD/PCDF Calibration Verification  
Native Analytes**

Lab Name CS3/CPM-11321-150  
Filename F190516A\_04  
Injected By ZMS  
Analyzed 05/16/2019 10:09

Instrument ID 10MSHR05 (F)  
GC Column ID ZB5-MS-629919  
ICAL ID F190508

Native Isomers	m/z's Forming Ratio (1)	Ion Abund. Ratio	QC Limits (2)	Conc Found	Conc. Range (ng/ml) (3)
2,3,7,8-TCDD	M/M+2	0.77	0.65 - 0.89	11.4	7.8 - 12.9
1,2,3,7,8-PeCDD	M+2/M+4	0.59	0.52 - 0.70	53.4	39 - 65
1,2,3,4,7,8-HxCDD	M+2/M+4	1.24	1.05 - 1.43	53.8	39 - 64
1,2,3,6,7,8-HxCDD	M+2/M+4	1.26	1.05 - 1.43	54.1	39 - 64
1,2,3,7,8,9-HxCDD	M+2/M+4	1.26	1.05 - 1.43	51.8	41 - 61
1,2,3,4,6,7,8-HpCDD	M+2/M+4	1.10	0.88 - 1.20	50.3	43 - 58
OCDD	M+2/M+4	0.87	0.76 - 1.02	100.1	79 - 126
2,3,7,8-TCDF	M/M+2	0.76	0.65 - 0.89	10.1	8.4 - 12.0
1,2,3,7,8-PeCDF	M+2/M+4	1.57	1.32 - 1.78	54.8	41 - 60
2,3,4,7,8-PeCDF	M+2/M+4	1.64	1.32 - 1.78	53.1	41 - 61
1,2,3,4,7,8-HxCDF	M+2/M+4	1.25	1.05 - 1.43	51.9	45 - 56
1,2,3,6,7,8-HxCDF	M+2/M+4	1.25	1.05 - 1.43	53.6	44 - 57
2,3,4,6,7,8-HxCDF	M+2/M+4	1.24	1.05 - 1.43	50.8	44 - 57
1,2,3,7,8,9-HxCDF	M+2/M+4	1.27	1.05 - 1.43	51.0	45 - 56
1,2,3,4,6,7,8-HpCDF	M+2/M+4	1.06	0.88 - 1.20	52.1	45 - 55
1,2,3,4,7,8,9-HpCDF	M+2/M+4	1.08	0.88 - 1.20	52.8	43 - 58
OCDF	M+2/M+4	0.88	0.76 - 1.02	111.7	63 - 159

1. See Table 8, Method 1613, for m/z specifications.
2. Ion Abundance Ratio Control Limits from Table 9, Method 1613.
3. Contract-required concentration range as specified in Table 6, Method 1613, under VER (10/94 Revision).

**REPORT OF LABORATORY ANALYSIS**

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

**Report Prepared for:**

Benita Miller  
Pace Analytical National  
12065 Lebanon Road  
Mount Juliet TN 37122

**REPORT OF  
LABORATORY  
ANALYSIS  
FOR PFAAs**

**Report Prepared Date:**

May 23, 2019

**Report Information:**

**Pace Project #: 10474224**

**Sample Receipt Date: 05/09/2019**

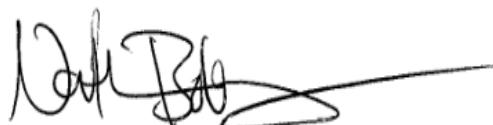
**Client Project #: L1096387: WG1278000 PFA**

**Client Sub PO #: L1096387**

**State Cert #: 2926.01**

**Invoicing & Reporting Options:**

**This report has been reviewed by:**



May 24, 2019

Nathan Boberg, Project Manager  
612-360-0728  
(612) 607-6444 (fax)  
nathan.boberg@pacelabs.com



**Report of Laboratory Analysis**

This report should not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

The results relate only to the samples included in this report.

## **DISCUSSION**

This report presents the results from the analyses performed on one sample and one duplicate sample submitted by a representative of Pace Analytical National. The samples were analyzed for one perfluorinated compound using a modified version of USEPA Method 537 Rev 1. Reporting limits were set to the quantitation limits.

A laboratory method blank was prepared and analyzed with the sample batch as part of our routine quality control procedures. The results show the blank was free of the target perfluorinated compound at the reporting limits. However, all three surrogates failed low. This indicates a low bias in the quantitation for the blank material. Also, the recoveries were high enough to generally preclude a false negative. Since the samples had significant levels of this compound, the results were not significantly impacted. However, Pace will re-extract the samples at no charge if the client can provide additional sample material.

Laboratory spike samples were also prepared with the sample batch using clean reference matrix that had been fortified with native standards. The target analyte recovery results were within the method limits. However, all three laboratory spikes had recoveries for the surrogate labeled d5-EtFOSAA that were lower than the method limit (flagged "Fail"). Since the analyte of interest does not associate with this surrogate and since the relative percent differences (RPDs) between one designated spike and its duplicate were within the method limits, the results were not significantly impacted by the low surrogate recovery.

Recoveries for four of the six isotopically-labeled surrogate standards in the sample extracts were within the target ranges specified in the method. The sample extracts had recoveries for the surrogate labeled 13C2\_PFHxA that were lower than the method limit (flagged "Fail"). The analyte of interest does not associate with this surrogate, therefore, no adverse impact on the sample results was expected.

The sample extracts had recoveries for the labeled PFOA internal standards that were lower than the method limit. Where internal standards are low, analytes typically quantitate higher than they are actually present in the sample extract. The analyte of interest does not use this internal standard, therefore, no adverse impact on the sample material was expected.

It should be noted that Pace Analytical has not yet completed the certification process for all analytes in this method. Therefore, the results have been marked "N2" as qualified. Results for the low level spikes that were below the calibration range were flagged "J".



Pace Analytical Services, LLC  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

## Minnesota Laboratory Certifications

Authority	Certificate #	Authority	Certificate #
A2LA	2926.01	Minnesota - Pet	1240
Alabama	40770	Mississippi	MN00064
Alaska - DW	MN00064	Missouri - DW	10100
Alaska - UST	17-009	Montana	CERT0092
Arizona	AZ0014	Nebraska	NE-OS-18-06
Arkansas - DW	MN00064	Nevada	MN00064
Arkansas - WW	88-0680	New Hampshire	2081
CNMI Saipan	MP0003	New Jersey (NE)	MN002
California	2929	New York	11647
Colorado	MN00064	North Carolina	27700
Connecticut	PH-0256	North Carolina -	27700
EPA Region 8+	via MN 027-053	North Carolina -	530
Florida (NELAP)	E87605	North Dakota	R-036
Georgia	959	Ohio - DW	41244
Guam	17-001r	Ohio - VAP	CL101
Hawaii	MN00064	Oklahoma	9507
Idaho	MN00064	Oregon - Primar	MN300001
Illinois	200011	Oregon - Secon	MN200001
Indiana	C-MN-01	Pennsylvania	68-00563
Iowa	368	Puerto Rico	MN00064
Kansas	E-10167	South Carolina	74003
Kentucky - DW	90062	South Dakota	NA
Kentucky - WW	90062	Tennessee	TN02818
Louisiana - DE	03086	Texas	T104704192
Louisiana - DW	MN00064	Utah (NELAP)	MN00064
Maine	MN00064	Virginia	460163
Maryland	322	Washington	C486
Massachusetts	M-MN064	West Virginia -	382
Michigan	9909	West Virginia -	9952C
Minnesota	027-053-137	Wisconsin	999407970
Minnesota - De	via MN 027-053	Wyoming - UST	2926.01

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## Reporting Flags

- A = Reporting Limit based on signal to noise
- B = Less than 10x higher than method blank level
- C = Result obtained from confirmation analysis
- D = Result obtained from analysis of diluted sample
- E = Exceeds calibration range
- I = Interference present
- J = Estimated value
- L = Suppressive interference, analyte may be biased low
- Nn = Value obtained from additional analysis
- P = PCDEInterference
- R = Recovery outside target range
- S = Peak saturated
- U = Analyte not detected
- V = Result verified by confirmation analysis
- X = %D Exceeds limits
- Y = Calculated using average of daily RFs
- \* = See Discussion

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## **Appendix A**

### **Sample Management**



Pace Analytical Services, Inc.  
1700 Elm Street - Suite 200  
Minneapolis, MN 55414

Tel: 612-607-1700  
Fax: 612-607-6444

## Sample ID Cross Reference

<u>Client Sample ID</u>	<u>Pace Sample ID</u>	<u>Date Received</u>	<u>Sample Type</u>
WW-20190505-002-DAY 7	10474224001	05/09/2019	Water
WW-20190505-002-DAY 7-Dup	10474224001-DUP	05/09/2019	Water

## REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,  
without the written consent of Pace Analytical Services, Inc.

## CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

<b>Section A</b>		<b>Section B</b>		<b>Section C</b>	
Required Client Information:		Required Project Information:		Invoice Information:	
Company: Pace Analytical National	Report To: Pace Analytical National Subout Team	Attention: Art Saunders		Page :	1 Of 1
Address: 12065 Lebanon Road	Copy To:	Company Name:			
Mount Juliet, TN 37122		Address:			
Email: SuboutTeam@pacenational.com	Purchase Order #: L1096387	Pace Quote:			
Phone: (615)773-9756	Project Name: N/A	Pace Project Manager: Nathan Boberg			
Requested Due Date: 22-May	Project #: N/A	Pace Profile #: 38076			

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / -) Sample Ids must be unique	MATRIX Drinking Water Water Waste Water Product Soil/Solid Oil Wipe Air Other Tissue	CODE DW WT WW P SL CL WP AR OT TS	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (S=GRAB C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives		DIOXIN/FURANS method 1613/PFOA-PFAS method 537	Residual Chlorine		
						START	END			H2SO4	HNO3				
						DATE	TIME			DATE	TIME			Unpreserved	HCl
1	WW-20190505-002-DAY 7	WT				05-May	14:00	2	2				X		06
2															
3															
10															
11															
12															
ADDITIONAL COMMENTS				RE-INVESTIGATED BY INSPECTION		DATE	TIME	ACCREDITED BY INSPECTION		DATE	TIME	SAMPLE CONDITIONS			
				Benita Miller		8-May	15:38	GMA/CP/price		5/19/19	8:30 0.7	Y	N	Y	
Pace Analytical National Batch: WG1278000															
Pace Analytical National SDGs: L1096387															
Location: Minneapolis, MN 55414				SAMPLER NAME AND SIGNATURE											
				PRINT Name of SAMPLER:											
				SIGNATURE of SAMPLER:				DATE Signed:							

WO# : 10474224



10474224

TEMP in C	Received on Ice (Y/N)	Custody Sealed (Y/N)	Cooler Samples (Y/N)	Intact (Y/N)

	Document Name: <b>Sample Condition Upon Receipt Form</b>	Document Revised: 05Apr2019 Page 1 of 1
	Document No.: <b>F-MN-L-213-rev.27</b>	Issuing Authority: <b>Pace Minnesota Quality Office</b>

<b>Sample Condition Upon Receipt</b>	<b>Client Name:</b> <i>Pace National</i>	<b>Project #:</b> <b>WO# : 10474224</b>
<b>Courier:</b>	<input checked="" type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> USPS <input type="checkbox"/> Client <input type="checkbox"/> Pace <input type="checkbox"/> Speedee <input type="checkbox"/> Commercial See Exception	<b>PM: NB3</b> <b>Due Date: 05/23/19</b>
<b>Tracking Number:</b>	<b>CLIENT: ESC_TN</b>	

**Custody Seal on Cooler/Box Present?**  Yes  No    **Seals Intact?**  Yes  No    **Biological Tissue Frozen?**  Yes  No  N/A

**Packing Material:**  Bubble Wrap     Bubble Bags     None     Other: \_\_\_\_\_    **Temp Blank?**  Yes  No

**Thermometer:**  T1(0461)  T2(1336)  T3(0459)  
 T4(0254)  T5(0048)    **Type of Ice:**  Wet     Blue     None     Dry     Melted

**Note:** Each West Virginia Sample must have temp taken (no temp blanks)

Temp should be above freezing to 6°C	<b>Cooler Temp Read w/temp blank:</b> <u>0.5</u> °C	<b>Average Corrected Temp</b> See Exceptions <b>(no temp blank only):</b> <u>0.7</u> °C
<b>Correction Factor:</b> <u>+0.2</u>	<b>Cooler Temp Corrected w/temp blank :</b> <u>0.7</u> °C	

**USDA Regulated Soil:** ( N/A, water sample/Other: \_\_\_\_\_)    **Date/Initials of Person Examining Contents:** GMNZ 5/19/19

Did samples originate in a quarantine zone within the United States: AL, AR, CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX or VA (check maps)?  Yes  No    Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)?  Yes  No

If Yes to either question, fill out a Regulated Soil Checklist (F-MN-Q-338) and include with SCUR/COC paperwork.

	<b>COMMENTS:</b>	
Chain of Custody Present and Filled Out?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Relinquished?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Sampler Name and/or Signature on COC?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	3.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	4.
Short Hold Time Analysis (<72 hr)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. <input type="checkbox"/> Fecal Coliform <input type="checkbox"/> HPC <input type="checkbox"/> Total Coliform/E coli <input type="checkbox"/> BOD/cBOD <input type="checkbox"/> Hex Chrome <input type="checkbox"/> Turbidity <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> Orthophos <input type="checkbox"/> Other
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Correct Containers Used? -Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8.
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Field Filtered Volume Received for Dissolved Tests?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10. Is sediment visible in the dissolved container? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is sufficient information available to reconcile the samples to the COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. If no, write ID/ Date/Time on Container Below: See Exception <u></u>
Matrix: <input checked="" type="checkbox"/> Water <input type="checkbox"/> Soil <input type="checkbox"/> Oil <input type="checkbox"/> Other		
All containers needing acid/base preservation have been checked?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12. Sample #  <input type="checkbox"/> NaOH <input type="checkbox"/> HNO <sub>3</sub> <input type="checkbox"/> H <sub>2</sub> SO <sub>4</sub> <input type="checkbox"/> Zinc Acetate
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , <2pH, NaOH>9 Sulfide, NaOH>12 Cyanide)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Positive for Res. <input type="checkbox"/> Yes Chlorine? <input type="checkbox"/> No pH Paper Lot# <input type="checkbox"/> Res. Chlorine    0-6 Roll    0-6 Strip    0-14 Strip
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxin/PFA	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Headspace in VOA Vials (greater than 6mm)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13. See Exception <input type="checkbox"/>
Trip Blank Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14. Pace Trip Blank Lot # (if purchased): _____
Trip Blank Custody Seals Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

#### CLIENT NOTIFICATION/RESOLUTION

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_  
Comments/Resolution: \_\_\_\_\_

Field Data Required?  Yes  No

Project Manager Review: Lathan Roberg

Date: 5/10/19

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled by: Cliff

**QC Matric lot #:** 186509  
**Time of Spiking:** 05/14/19 14:30  
**SPE Cartridge:** 5322-0024  
**Balance:** 10BALQ

**TRIZMA Lot #:** 183004/18F285  
**Optima H2O Lot #:** 186509  
**Methanol Lot #:** 186960

**Extract Start:** 05/14/19 15:50  
**Extract End:** 05/14/19 18:00  
**Setup By:** PY

	Lot Number	Amount	Initials	Expiration	Dispenser	Witness
<b>Internal</b>	12332-184	100	NH	11/03/19	Q503	wm
<b>Surrogate</b>	12332-187	100	NH	11/10/19	Q503	PY
<b>Native Lo</b>	12332-167	10	NH	10/19/19	Q523	PY
<b>Native Mid</b>						
<b>Native Hi</b>	12332-167	200	NH	10/19/19	Q497	PY
<b>GenX IS</b>	12332-175	200	NH	10/25/19	Q497	PY

#	Sample ID	GenX IS	Surrogate	Natives	Full Bottle Weight	Empty Bottle Weight	Amount Extracted	Comments
1	BLANK-70480	X	X		285.8	37.1	248.7	
2	LCS-70481	X	X		301.7	36.8	264.9	
3	LCS-70482	X	X		295.0	36.9	258.1	
4	LCSD-70483	X	X		292.9	36.8	256.2	
5	35466723003	X	X		296.3	38.3	258.0	
6	10473987001	X	X		276.7	46.0	230.8	
7	10474224001	X	X		282.5	38.3	244.2	
8	10474111007	X	X		289.5	46.0	243.5	
9	10474330001	X	X		292.8	0.8	292.0	
10	10474332001	X	X		300.1	0.8	299.3	
11	92428426001	X	X		281.7	37.2	244.5	
12	92428426002	X	X		284.3	37.1	247.2	
13	10474492001	X	X		290.3	40.3	250.0	
14	10474224001-DUP	X	X		283.0	38.0	245.1	



EB-24584

## **Appendix B**

### **Sample Analysis Summary**



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified)**  
Sample Analysis Summary

Client's Sample ID	WW-20190505-002-DAY 7	Date Extracted	05/14/2019
Lab Sample ID	10474224001	Total Amount Extracted	244 mL
Filename	B190517D_046	ICAL ID	190517B02
Matrix	Surface_Water	Starting CCal	B190517D_032
Collected	05/06/2019	Ending CCal	B190517D_061
Received	05/09/2019	Method Blank Filename	B190516C_004

Compound	Concentration (ng/L)	PQL (ng/L)	MDL (ng/L)	Dilution	Analyzed	CAS No.	Qual.
PFOS	62	2.0	0.64	1	05/18/2019 03:07	1763-23-1	N2

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	5.7	286	70 - 130	Fail
13C2_PFDA	2.0	1.9	95	70 - 130	Pass
d5-EtFOSAA	8.0	7.7	97	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPOPrA	133277	79768 - 239305	120314 - 240627	Pass
13C2_PFOA	85387	200784 - 602353	292788 - 585577	Fail
13C4_PFOS	556747	280253 - 840760	368818 - 737636	Pass
d3-MeFOSAA	290511	125322 - 375966	167458 - 334916	Pass

50-150% of Ical area

70-140% of the preceding CCV area

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified)**  
Sample Analysis Summary

Client's Sample ID	WW-20190505-002-DAY 7-Dup	Date Extracted	05/14/2019
Lab Sample ID	10474224001-DUP	Total Amount Extracted	245 mL
Filename	B190517D_054	ICAL ID	190517B02
Matrix	Surface_Water	Starting CCal	B190517D_032
Collected	05/06/2019	Ending CCal	B190517D_061
Received	05/09/2019	Method Blank Filename	B190516C_004

Compound	Concentration (ng/L)	PQL (ng/L)	MDL (ng/L)	Dilution	Analyzed	CAS No.	Qual.
PFOS	56	2.0	0.64	1	05/18/2019 04:41	1763-23-1	N2

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	6.0	298	70 - 130	Fail
13C2_PFDA	2.0	2.6	128	70 - 130	Pass
d5-EtFOSAA	8.0	9.7	122	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPOPrA	126575	79768 - 239305	120314 - 240627	Pass
13C2_PFOA	88253	200784 - 602353	292788 - 585577	Fail
13C4_PFOS	547123	280253 - 840760	368818 - 737636	Pass
d3-MeFOSAA	224844	125322 - 375966	167458 - 334916	Pass

50-150% of Ical area

70-140% of the preceding CCV area

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

## **Appendix C**

### **QC and Calibration Results Summary**



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Blank Analysis Summary**

Lab Sample ID	BLANK-70480	Total Amount Extracted	249 mL
Filename	B190516C_004	ICAL ID	190515A02
Matrix	Water	Starting CCal	B190516C_002
Date Extracted	05/14/2019	Ending CCal	B190516C_015

Compound	Concentration (ng/L)	PQL (ng/L)	MDL (ng/L)	Dilution	Analyzed	CAS No.	Qual.
PFOS	ND	1.9	0.63	1	05/20/2019 14:06	1763-23-1	N2

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.2	62	70 - 130	Fail
13C2_PFDA	2.0	1.2	60	70 - 130	Fail
d5-EtFOSAA	8.0	3.0	37	70 - 130	Fail

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPOPrA	102249	83450 - 250349	98819 - 197638	Pass
13C2_PFOA	423414	233392 - 700175	326486 - 652971	Pass
13C4_PFOS	573143	311065 - 933194	445814 - 891628	Pass
d3-MeFOSAA	270734	142260 - 426781	200156 - 400311	Pass

50-150% of Ical area

70-140% of the preceding CCV area

N2 = The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Laboratory Control Sample (LCS)**

LCS Lab Sample ID	LCS-70481	Matrix	Water
LCS Filename	B190517D_011	Dilution	1
Total Amount Extracted	265mL	Extracted	05/14/2019
ICAL ID	190517B02	Analyzed	05/17/2019 20:16
Start CCal Filename	B190517D_002	Injected By	WM
End CCal Filename	B190517D_015		
Method Blank Filename	B190516C_004		

Compound	Spiked (ng/L)	Recovered (ng/L)	Recovery %	Limits
PFOS	1.8	1.7 J	92	50.0 - 150.0

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.5	77	70 - 130	Pass
13C2_PFDA	2.0	1.6	80	70 - 130	Pass
d5-EtFOSAA	8.0	4.9	61	70 - 130	Fail

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPrOPrA	131479	79768 - 239305	119464 - 238928	Pass
13C2_PFOA	379740	200784 - 602353	280613 - 561226	Pass
13C4_PFOS	572480	280253 - 840760	387774 - 775547	Pass
d3-MeFOSAA	247589	125322 - 375966	175537 - 351074	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Laboratory Control Sample (LCS)**

LCS Lab Sample ID	LCS-70482	Matrix	Water
LCS Filename	B190517D_012	Dilution	1
Total Amount Extracted	258mL	Extracted	05/14/2019
ICAL ID	190517B02	Analyzed	05/17/2019 20:27
Start CCal Filename	B190517D_002	Injected By	WM
End CCal Filename	B190517D_015		
Method Blank Filename	B190516C_004		

Compound	Spiked (ng/L)	Recovered (ng/L)	Recovery %	Limits
PFOS	37	33	88	70.0 - 130.0

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.5	76	70 - 130	Pass
13C2_PFDA	2.0	1.6	80	70 - 130	Pass
d5-EtFOSAA	8.0	4.0	50	70 - 130	Fail

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPrOPrA	141295	79768 - 239305	119464 - 238928	Pass
13C2_PFOA	408081	200784 - 602353	280613 - 561226	Pass
13C4_PFOS	553089	280253 - 840760	387774 - 775547	Pass
d3-MeFOSAA	255631	125322 - 375966	175537 - 351074	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Laboratory Control Sample Duplicate (LCSD)**

LCSD Lab Sample ID	LCSD-70483	LCS Filename	B190517D_012
LCSD Filename	B190517D_013	Matrix	Water
Total Amount Extracted	256mL	Dilution	1
ICAL ID	190517B02	Extracted	05/14/2019
Start CCAL Filename	B190517D_002	Analyzed	05/17/2019 20:39
End CCAL Filename	B190517D_015	Injected By	WM
Method Blank Filename	B190516C_004		

Compound	Spiked (ng/L)	Recovered (ng/L)	Recovery %	Recovery Limits	RPD %
----------	------------------	---------------------	---------------	--------------------	----------

PFOS	37	34	92	70.0 - 130.0	5
------	----	----	----	--------------	---

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.6	82	70 - 130	Pass
13C2_PFDA	2.0	1.7	87	70 - 130	Pass
d5-EtFOSAA	8.0	4.9	62	70 - 130	Fail

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPOPrA	183170	79768 - 239305	119464 - 238928	Pass
13C2_PFOA	383243	200784 - 602353	280613 - 561226	Pass
13C4_PFOS	534380	280253 - 840760	387774 - 775547	Pass
d3-MeFOSAA	230502	125322 - 375966	175537 - 351074	Pass

50-150% of Ical area

70-140% of the preceding CCV area

**PFAA Initial Calibration Response Factor Summary**

ICAL ID	<b>190515A02</b>	Data Files:	CS-1	B190515A_017	13:00
Calibration Date	05/15/2019		CS-2	B190515A_018	13:12
Instrument	10LCMS02		CS-3	B190515A_019	13:24
Column Phase	C18		CS-4	B190515A_020	13:35
Column ID No.	H18-061776		CS-5	B190515A_021	13:47
Analyst	NH		CS-6	B190515A_022	13:59

**Response Factors**

Compound	Type	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6	Slope	R <sup>2</sup>
13C3_PFPrOPrA	L	10400	11000	11600	11500	10400	11100	11000	0.998
13C2_PFOA	L	212000	210000	212000	207000	216000	199000	210000	0.999
13C4_PFOS	L	97900	99400	102000	97800	97100	93200	97800	0.999
d3-MeFOSAA	L	45000	46000	43500	44400	45500	43400	44600	1.000
13C2_PFHxA	L	1.12	1.17	1.13	1.15	1.13	1.17	1.14	1.000
13C2_PFDA	L	5.83	5.32	5.69	5.64	5.93	5.50	5.65	0.999
d5-EtFOSAA	L	0.960	0.911	1.01	0.942	0.903	0.873	0.932	0.998
PFBA	L	0.739	0.742	0.707	0.718	0.686	0.735	0.725	0.999
PFPeA	L	0.857	0.832	0.877	0.900	0.853	0.885	0.880	1.000
PFBS	L	0.446	0.466	0.456	0.460	0.442	0.472	0.466	0.999
PFHxA	L	0.953	0.897	0.912	0.917	0.902	0.914	0.912	1.000
PFPrOPrA	L	1.64	1.45	1.46	1.39	1.52	1.47	1.48	1.000
PFHpA	L	0.998	0.992	1.00	0.998	0.963	0.976	0.975	1.000
NaDONA	L	22.8	21.7	20.4	19.4	20.7	18.3	18.9	0.997
PFHxS	L	0.362	0.361	0.348	0.358	0.368	0.374	0.372	1.000
PFOA	L	0.935	0.981	0.950	0.971	0.900	0.946	0.938	1.000
PFNA	L	1.96	1.82	1.86	1.94	1.86	1.84	1.85	1.000
PFOS	L	0.984	0.939	0.994	0.987	1.01	1.01	1.01	1.000
PFDA	L	4.28	4.38	4.15	4.10	4.09	4.05	4.06	1.000
PFUdA	L	7.36	6.35	7.29	6.82	6.74	6.08	6.25	0.998
N-MeFOSAA	L	0.993	0.975	1.12	1.02	1.02	1.02	1.02	1.000
N-EtFOSAA	L	1.15	1.13	1.19	1.17	1.17	1.08	1.11	0.999
PFDS	L	2.40	2.38	2.52	2.49	2.38	2.49	2.47	1.000
PFDoA	L	4.52	4.40	4.70	4.54	4.26	4.42	4.40	1.000
PFTrDA	L	4.49	4.34	4.67	4.52	4.34	4.52	4.48	1.000
PFTeDA	L	1.62	1.50	1.67	1.63	1.58	1.59	1.59	1.000
PFHxDA	L	2.82	2.69	2.60	2.56	2.48	2.59	2.57	1.000
PFODA	L	1.51	1.39	1.44	1.51	1.45	1.57	1.54	0.999

Slope: Linear calibration



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

### PFAA Initial Calibration Recovery Summary

ICAL ID	190515A02	Data Files:	CS-1	B190515A_017	13:00
Calibration Date	05/15/2019		CS-2	B190515A_018	13:12
Instrument	10LCMS02		CS-3	B190515A_019	13:24
Column Phase	C18		CS-4	B190515A_020	13:35
Column ID No.	H18-061776		CS-5	B190515A_021	13:47
Analyst	NH		CS-6	B190515A_022	13:59

#### %Recoveries

Compound	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6
13C3_PFPPrOPrA	95	100	106	104	95	101
13C2_PFOA	101	100	101	99	103	95
13C4_PFOS	100	102	104	100	99	95
d3-MeFOSAA	101	103	98	99	102	97
13C2_PFHxA	98	102	99	101	99	102
13C2_PFDA	103	94	101	100	105	97
d5-EtFOSAA	103	98	108	101	97	94
PFBA	102	102	98	99	95	101
PFPeA	97	95	100	102	97	101
PFBS	96	100	98	99	95	101
PFHxA	105	98	100	101	99	100
PFPrOPrA	111	98	99	94	103	100
PFHpA	102	102	103	102	99	100
NaDONA	121	115	108	103	110	97
PFHxS	97	97	94	96	99	101
PFOA	100	105	101	104	96	101
PFNA	106	98	101	105	101	99
PFOS	98	93	99	98	100	100
PFDA	105	108	102	101	101	100
PFUdA	118	102	117	109	108	97
N-MeFOSAA	97	95	110	100	100	100
N-EtFOSAA	104	102	108	106	106	98
PFDS	97	96	102	101	97	101
PFDoA	103	100	107	103	97	100
PFTrDA	100	97	104	101	97	101
PFTeDA	102	94	105	102	99	100
PFHxDA	110	105	101	99	96	101
PFODA	98	91	93	98	94	102



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

### Method 537 (Modified) Calibration Verification Summary ICV

Lab Calibration ID ICV-12332-185  
Run File Name B190515A\_024  
Injected By WM  
Analyzed 05/15/2019 14:22  
Instrument ID 10LCMS02  
Column ID H18-061776  
Ical ID 190515A02

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	19	19	98	50.0-150.0	459614

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	97	70 - 130	Pass
13C2_PFDA	2.0	2.0	99	70 - 130	Pass
d5-EtFOSAA	8.0	8.0	101	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPtOPrA	175893	87991 - 263973	---	Pass
13C2_PFOA	408510	209570 - 628710	---	Pass
13C4_PFOS	555795	280766 - 842297	---	Pass
d3-MeFOSAA	347544	178513 - 535540	---	Pass

50-150% of Ical area

70-140% of the preceding CCV area

**PFAA Initial Calibration Response Factor Summary**

ICAL ID	<b>190517B02</b>	Data Files:	CS-1	B190517B_001	13:45
Calibration Date	05/17/2019		CS-2	B190517B_002	13:57
Instrument	10LCMS02		CS-3	B190517B_003	14:08
Column Phase	C18		CS-4	B190517B_004	14:20
Column ID No.	H18-061776		CS-5	B190517B_005	14:32
Analyst	NH		CS-6	B190517B_006	14:44

**Response Factors**

Compound	Type	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6	Slope	R <sup>2</sup>
13C3_PFPrOPrA	L	10300	9560	9240	9690	10800	10200	9970	0.997
13C2_PFOA	L	202000	202000	212000	197000	199000	193000	201000	0.999
13C4_PFOS	L	103000	96500	101000	94500	98000	93000	97600	0.999
d3-MeFOSAA	L	32700	29400	32900	31600	31900	29400	31300	0.998
13C2_PFHxA	L	1.20	1.16	1.16	1.20	1.17	1.17	1.18	1.000
13C2_PFDA	L	7.13	7.75	6.60	6.93	7.49	7.68	7.26	0.997
d5-EtFOSAA	L	0.934	1.00	0.931	0.909	0.961	0.893	0.939	0.999
PFBA	L	0.817	0.835	0.797	0.791	0.760	0.737	0.745	1.000
PFPeA	L	0.889	0.864	0.885	0.938	0.901	0.904	0.905	1.000
PFBS	L	0.466	0.434	0.442	0.482	0.476	0.466	0.468	1.000
PFHxA	L	0.958	0.878	0.866	0.884	0.875	0.849	0.856	1.000
PFPrOPrA	L	1.43	1.54	1.61	1.46	1.34	1.50	1.47	0.998
PFHpA	L	1.07	1.03	1.03	1.07	1.08	1.02	1.03	0.999
NaDONA	L	23.0	23.3	26.0	23.3	21.0	18.9	19.6	0.995
PFHxS	L	0.339	0.359	0.356	0.393	0.371	0.373	0.374	1.000
PFOA	L	1.02	0.956	0.921	0.993	0.944	0.955	0.954	1.000
PFNA	L	1.81	1.89	1.85	1.96	1.86	1.75	1.78	0.999
PFOS	L	0.934	0.959	0.966	1.04	1.00	1.01	1.01	1.000
PFDA	L	5.29	5.68	5.45	5.55	5.62	5.33	5.40	1.000
PFUdA	L	8.61	8.85	8.86	8.52	8.29	8.41	8.40	1.000
N-MeFOSAA	L	1.10	1.04	1.01	1.04	1.07	1.06	1.06	1.000
N-EtFOSAA	L	1.17	1.24	1.16	1.14	1.11	1.10	1.10	1.000
PFDS	L	3.23	3.41	3.20	3.34	3.22	3.57	3.49	0.998
PFDoA	L	5.34	5.28	5.17	5.33	5.14	5.61	5.50	0.999
PFTrDA	L	5.23	5.64	5.48	5.37	5.45	5.72	5.65	1.000
PFTeDA	L	1.77	1.76	1.83	1.77	1.86	1.94	1.91	0.999
PFHxDA	L	2.73	2.96	2.96	2.74	2.83	3.06	3.00	0.999
PFODA	L	1.42	1.55	1.58	1.49	1.50	1.65	1.61	0.998

Slope: Linear calibration



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

### PFAA Initial Calibration Recovery Summary

ICAL ID	<b>190517B02</b>	Data Files:	CS-1	B190517B_001	13:45
Calibration Date	05/17/2019		CS-2	B190517B_002	13:57
Instrument	10LCMS02		CS-3	B190517B_003	14:08
Column Phase	C18		CS-4	B190517B_004	14:20
Column ID No.	H18-061776		CS-5	B190517B_005	14:32
Analyst	NH		CS-6	B190517B_006	14:44

#### %Recoveries

Compound	CAL1	CAL2	CAL3	CAL4	CAL5	CAL6
13C3_PFPrOPrA	103	96	93	97	109	103
13C2_PFOA	101	101	105	98	99	96
13C4_PFOS	105	99	104	97	100	95
d3-MeFOSAA	104	94	105	101	102	94
13C2_PFHxA	102	99	99	102	100	99
13C2_PFDA	98	107	91	95	103	106
d5-EtFOSAA	99	107	99	97	102	95
PFBA	110	112	107	106	102	99
PFPeA	98	96	98	104	100	100
PFBS	100	93	94	103	102	100
PFHxA	112	103	101	103	102	99
PFPrOPrA	97	105	110	99	92	102
PFHpA	104	100	100	104	105	99
NaDONA	117	119	133	119	108	96
PFHxS	91	96	95	105	99	100
PFOA	107	100	97	104	99	100
PFNA	101	106	104	110	105	98
PFOS	93	95	96	103	100	100
PFDA	98	105	101	103	104	99
PFUdA	103	105	105	101	99	100
N-MeFOSAA	104	98	95	98	101	100
N-EtFOSAA	106	113	105	104	100	100
PFDS	93	98	92	96	92	102
PFDoA	97	96	94	97	93	102
PFTrDA	92	100	97	95	96	101
PFTeDA	92	92	96	92	97	101
PFHxDA	91	99	99	91	94	102
PFODA	88	96	98	92	93	102



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

### Method 537 (Modified) Calibration Verification Summary ICV

Lab Calibration ID ICV-12332-185  
Run File Name B190517B\_008  
Injected By WM  
Analyzed 05/17/2019 15:07  
Instrument ID 10LCMS02  
Column ID H18-061776  
Ical ID 190517B02

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	19	18	96	50.0-150.0	438397

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	98	70 - 130	Pass
13C2_PFDA	2.0	1.9	96	70 - 130	Pass
d5-EtFOSAA	8.0	7.5	94	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPtOPrA	161853	79768 - 239305	---	Pass
13C2_PFOA	390918	200784 - 602353	---	Pass
13C4_PFOS	544153	280253 - 840760	---	Pass
d3-MeFOSAA	260272	125322 - 375966	---	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Calibration Verification Summary  
CCV**

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190516C_002	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/16/2019 17:51	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.7	91	50.0-150.0	44242

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	102	70 - 130	Pass
13C2_PFDA	2.0	2.1	105	70 - 130	Pass
d5-EtFOSAA	8.0	8.8	109	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPtOPrA	176112	87991 - 263973	116119 - 232238	Pass
13C2_PFOA	395482	209570 - 628710	279708 - 559417	Pass
13C4_PFOS	579572	280766 - 842297	403600 - 807199	Pass
d3-MeFOSAA	324872	178513 - 535540	223353 - 446705	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Calibration Verification Summary  
CCV**

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190516C_015	Column ID	H18-061776
Injected By	WM	Ical ID	190515A02
Analyzed	05/16/2019 20:24	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.5	99	70.0-130.0	239429

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	94	70 - 130	Pass
13C2_PFDA	2.0	2.3	114	70 - 130	Pass
d5-EtFOSAA	8.0	8.4	105	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPrOPrA	160581	87991 - 263973	123279 - 246557	Pass
13C2_PFOA	425591	209570 - 628710	276837 - 553674	Pass
13C4_PFOS	575364	280766 - 842297	405701 - 811401	Pass
d3-MeFOSAA	319004	178513 - 535540	227411 - 454821	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Calibration Verification Summary  
CCV**

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190517D_002	Column ID	H18-061776
Injected By	WM	Ical ID	190517B02
Analyzed	05/17/2019 18:30	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.8	94	50.0-150.0	44060

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	96	70 - 130	Pass
13C2_PFDA	2.0	1.9	96	70 - 130	Pass
d5-EtFOSAA	8.0	7.6	94	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPtOPrA	170663	79768 - 239305	126546 - 253093	Pass
13C2_PFOA	400876	200784 - 602353	313783 - 627566	Pass
13C4_PFOS	553962	280253 - 840760	422703 - 845406	Pass
d3-MeFOSAA	250767	125322 - 375966	189563 - 379126	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Calibration Verification Summary  
CCV**

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190517D_015	Column ID	H18-061776
Injected By	WM	Ical ID	190517B02
Analyzed	05/17/2019 21:03	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.8	102	70.0-130.0	239582

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.9	97	70 - 130	Pass
13C2_PFDA	2.0	2.0	99	70 - 130	Pass
d5-EtFOSAA	8.0	8.2	103	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPrOPrA	181488	79768 - 239305	119464 - 238928	Pass
13C2_PFOA	414805	200784 - 602353	280613 - 561226	Pass
13C4_PFOS	558901	280253 - 840760	387774 - 775547	Pass
d3-MeFOSAA	258046	125322 - 375966	175537 - 351074	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

**Method 537 (Modified) Calibration Verification Summary  
CCV**

Lab Calibration ID	CAL-12332-186-01	Instrument ID	10LCMS02
Run File Name	B190517D_032	Column ID	H18-061776
Injected By	WM	Ical ID	190517B02
Analyzed	05/18/2019 00:22	Level	Low

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	1.9	1.9	99	50.0-150.0	43877

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	1.8	92	70 - 130	Pass
13C2_PFDA	2.0	2.1	105	70 - 130	Pass
d5-EtFOSAA	8.0	8.2	102	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPPrOPrA	171877	79768 - 239305	108834 - 217667	Pass
13C2_PFOA	418269	200784 - 602353	282145 - 564291	Pass
13C4_PFOS	526883	280253 - 840760	385655 - 771309	Pass
d3-MeFOSAA	239226	125322 - 375966	180305 - 360610	Pass

50-150% of Ical area

70-140% of the preceding CCV area



Pace Analytical Services, LLC

1700 Elm Street, Suite 200

Minneapolis, MN 55414

(612) 607-1700

### Method 537 (Modified) Calibration Verification Summary CCV

Lab Calibration ID	CAL-12332-186-03	Instrument ID	10LCMS02
Run File Name	B190517D_061	Column ID	H18-061776
Injected By	WM	Ical ID	190517B02
Analyzed	05/18/2019 06:03	Level	Mid

Compound	Known Conc.	Conc. Found	%Recovery	Recovery Limits	Area
PFOS	9.6	9.2	96	70.0-130.0	246872

**Surrogate Standards**

SS Compound	Spiked	Found	%Recovery	Limits	Pass/Fail
13C2_PFHxA	2.0	2.0	98	70 - 130	Pass
13C2_PFDA	2.0	2.2	108	70 - 130	Pass
d5-EtFOSAA	8.0	8.0	100	70 - 130	Pass

**Internal Standards**

IS Compound	Area	Ical Limits	CCV Limits	Pass/Fail
13C3_PFPtOPtA	183550	79768 - 239305	120314 - 240627	Pass
13C2_PFOA	427321	200784 - 602353	292788 - 585577	Pass
13C4_PFOS	612423	280253 - 840760	368818 - 737636	Pass
d3-MeFOSAA	263003	125322 - 375966	167458 - 334916	Pass

50-150% of Ical area

70-140% of the preceding CCV area